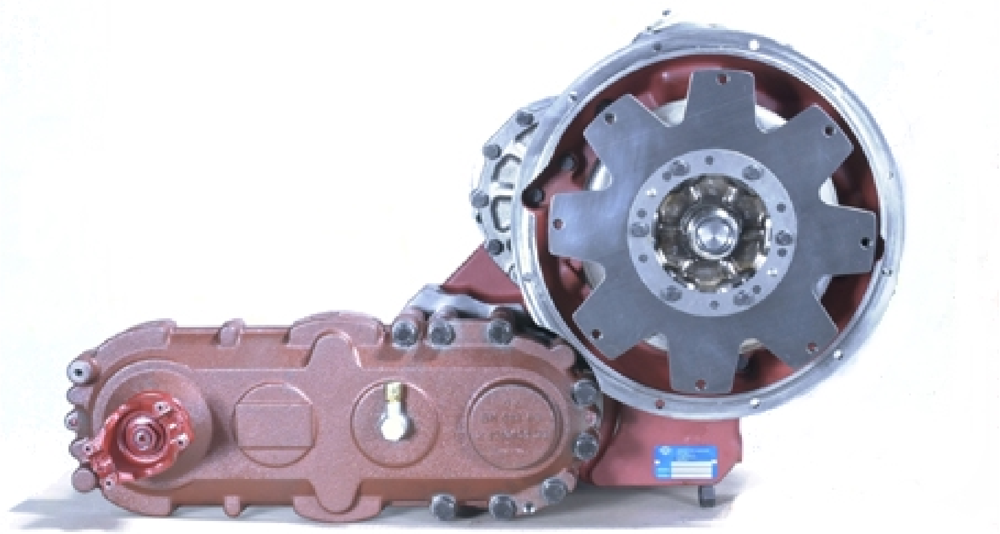
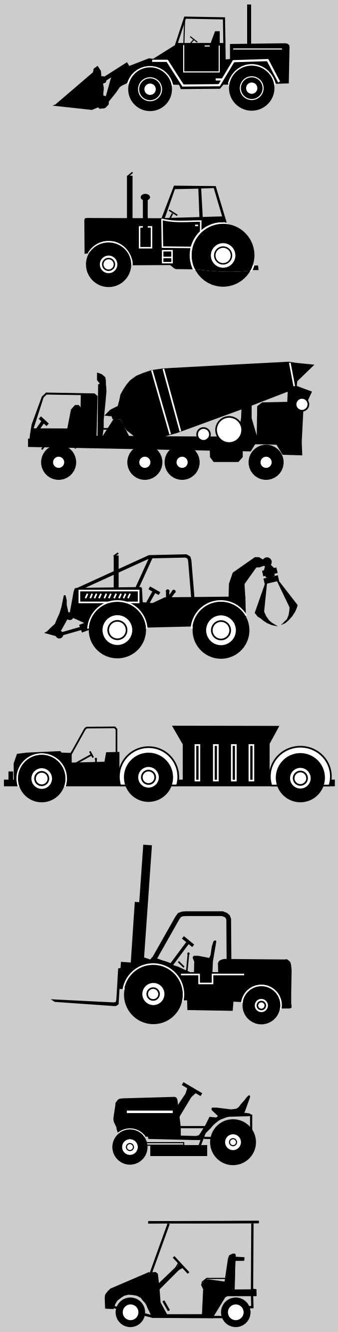
SUPPLEMENT

3 & 4 SHAFT DROP BOX
To be used in conjunction with the T12000 3, 4 & 6 Speed Intermediate Drop





SPICER OFF-HIGHWAY COMPONENTS

DANA

CD-ROM: 8100038

MANUAL: 8100039

NOTICE

All information mentioned in the maintenance and service manual T12000 powershift transmission 3, 4 & 6 speed Intermediate Drop is valid, unless otherwise specified in this 3 & 4 shaft drop box supplement for the T12000 Intermediate Drop.

FOREWORD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the **SPICER OFF-HIGWAY PRODUCTS** product.

Extreme care has been exercised in the design, selection of materials, and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated, will be reimbursed many times in low cost operation and trouble-free service.

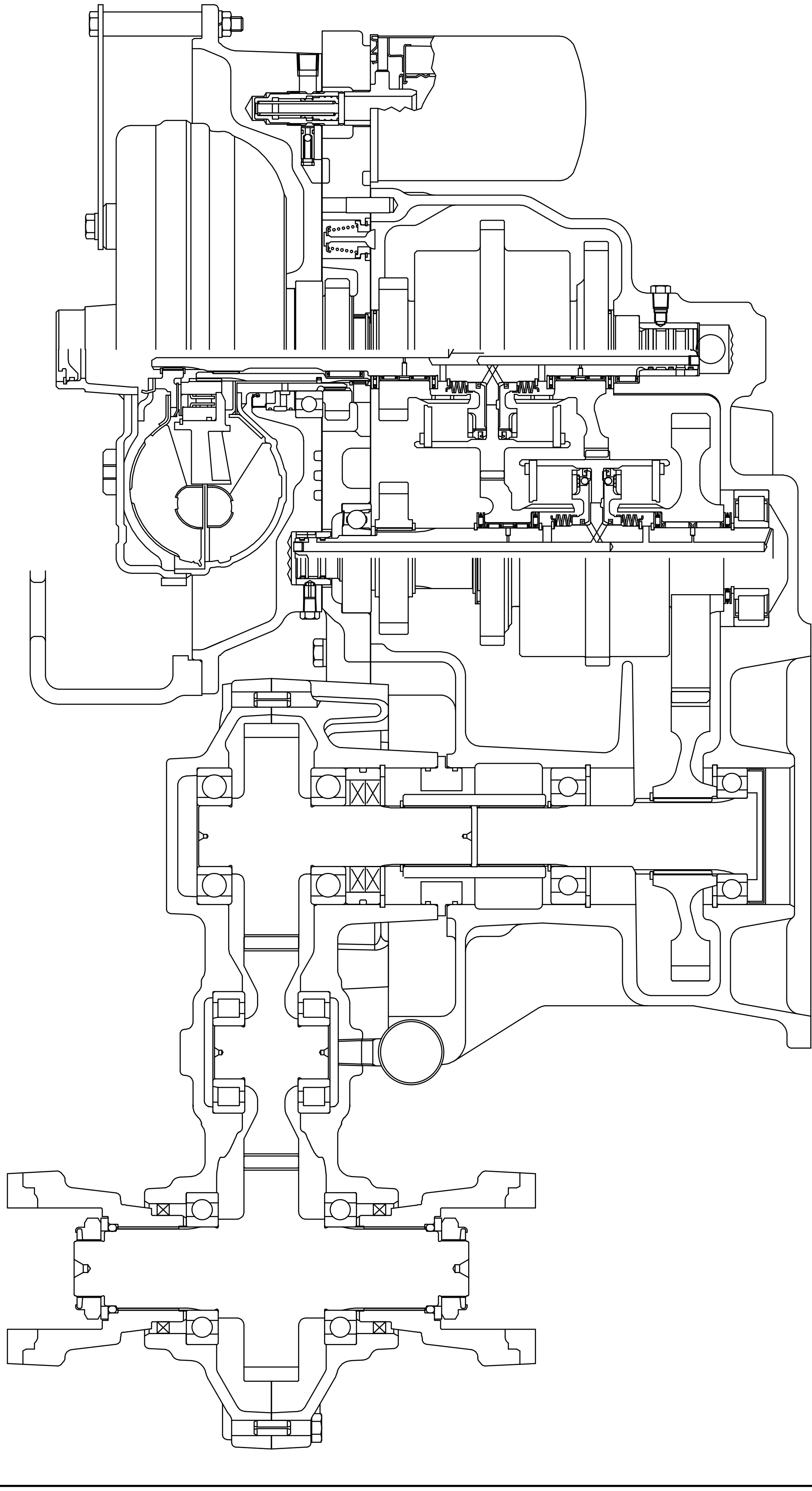
In order to become familiar with the various parts of the product, its principle of operation, troubleshooting and adjustments, it is urged that the mechanic studies the instructions in this manual carefully and uses it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only **SPICER OFF-HIGHWAY PRODUCTS** approved parts as listed in the applicable parts manual should be used. Use of “will-fit” or non-approved parts may endanger proper operation and performance of the equipment. **SPICER OFF-HIGHWAY PRODUCTS** does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied or approved by **SPICER OFF-HIGHWAY PRODUCTS**.

IMPORTANT

ALWAYS FURNISH THE DISTRIBUTOR WITH THE SERIAL AND MODEL NUMBER WHEN ORDERING PARTS.

3 SHAFT



4 SHAFT

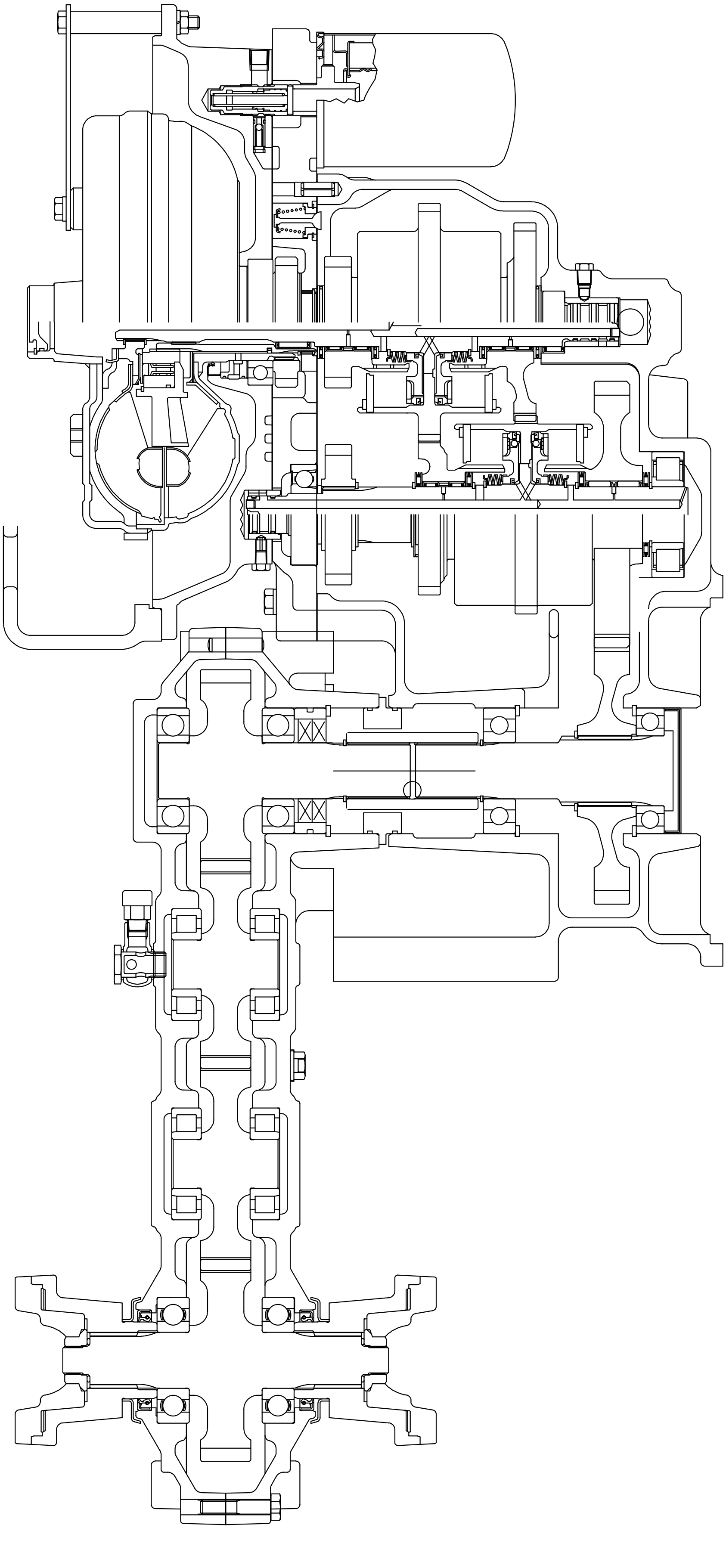


Table of Content

1. SAFETY PRECAUTIONS

To reduce the chance of personal injury and/or property damage, the following instructions must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe reliable operation of the machine. if replacement parts are required, the parts must be replaced by spare parts which have the same part number or with an equivalent part. **DO NOT USE A SPARE PART OF LESSER QUALITY.**

The service procedures recommended in this manual are effective methods for performing service and repair. Some of these procedures require the use of tools specifically designed for the purpose.

Accordingly, anyone who intends to use a spare part, service procedure or tool, which is not recommended by **SPICER OFF-HIGHWAY PRODUCTS**, must first determine that neither his safety nor the safe operation of the machine will be jeopardised by the spare part, service procedure or tool selected.

IMPORTANT

IT IS IMPORTANT TO NOTE THAT THIS MANUAL CONTAINS VARIOUS 'CAUTIONS AND NOTICES' THAT MUST BE CAREFULLY OBSERVED IN ORDER TO REDUCE THE RISK OF PERSONAL INJURY DURING SERVICE OR REPAIR, OR THE POSSIBILITY THAT IMPROPER SERVICE OR REPAIR MAY DAMAGE THE UNIT OR RENDER IT UNSAFE.

IT IS ALSO IMPORTANT TO UNDERSTAND THAT THESE ' CAUTIONS AND NOTICES' ARE NOT EXHAUSTIVE, BECAUSE IT IS IMPOSSIBLE TO WARN ABOUT ALL POSSIBLE HAZARDOUS CONSEQUENCES THAT MIGHT RESULT FROM FAILURE TO FOLLOW THESE INSTRUCTIONS.

2. CLEANING, INSPECTION AND LEGEND SYMBOLS

2.1 CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

⚠ **CAUTION**

CARE SHOULD BE EXERCISED TO AVOID SKIN RASHES, FIRE HAZARDS, AND INHALATION OF VAPOURS WHEN USING SOLVENT TYPE CLEANERS.

2.1.1 Bearings

Remove bearings from cleaning fluid and strike flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning. DO NOT SPIN BEARINGS WHEN DRYING. Bearings may be rotated slowly by hand to facilitate drying process.

2.1.2 Housings

Clean interior and exterior of housings, bearing caps, etc... thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions providing these parts do not have ground or polished surfaces.
Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

⚠ **CAUTION**

CARE SHOULD BE EXERCISED TO AVOID INHALATION OF VAPOURS AND SKIN RASHES WHEN USING ALKALI CLEANERS.

All parts cleaned must be thoroughly dried immediately by using moistere-free compressed air or soft lintless absorbant wiping rags, free of abrasive materials such as metal fillings, contaminated oil or lapping compound.

2.2 INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

2.2.1 Bearings

Carefully inspect all rollers: cages and cups for wear, chipping, or nicks to determine fitness of bearings for further use. DO NOT REPLACE A BEARING CONE OR CUP INDIVIDUALLY without replacing the mating cup or cone at the same time. After inspection, dip bearings in Automatic Transmission Fluid and wrap in clean lintless cloth or paper to protect them until installed.

2.2.2 Oil seals, gaskets, etc.

Replacement of spring load oils seals, “O” rings, metal sealing rings, gaskets and snap rings is more economical when the unit is disassembled than premature overhaul to replace these parts at a future time.
Further loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly.
Sealing members should be handled carefully, particularly when being installed. Cutting, scratching or curling under of lips of seals seriously impairs its efficiency.
When assembling new metal type sealing rings, these should be lubricated with a coat of chassis grease to stabilise rings in their grooves for ease of assembly of mating members. Lubricate all “O” rings and seals with recommended type Automatic Transmission Fluid before assembly.

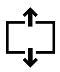
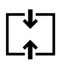
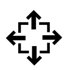
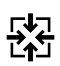
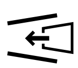
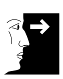
2.2.3 Gears and Shafts

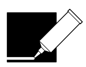
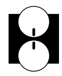
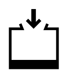
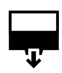
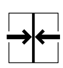
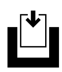
If Magna-Flux process is available, use process to check parts. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. If gear teeth show spots where case hardening is worn through or cracked, replace with new gear. Small nicks may be removed with suitable hone. Inspect shafts and quills to make certain they are not sprung, bent or spline-twisted, and that shafts are true.

2.2.4 Housing, Covers, etc.

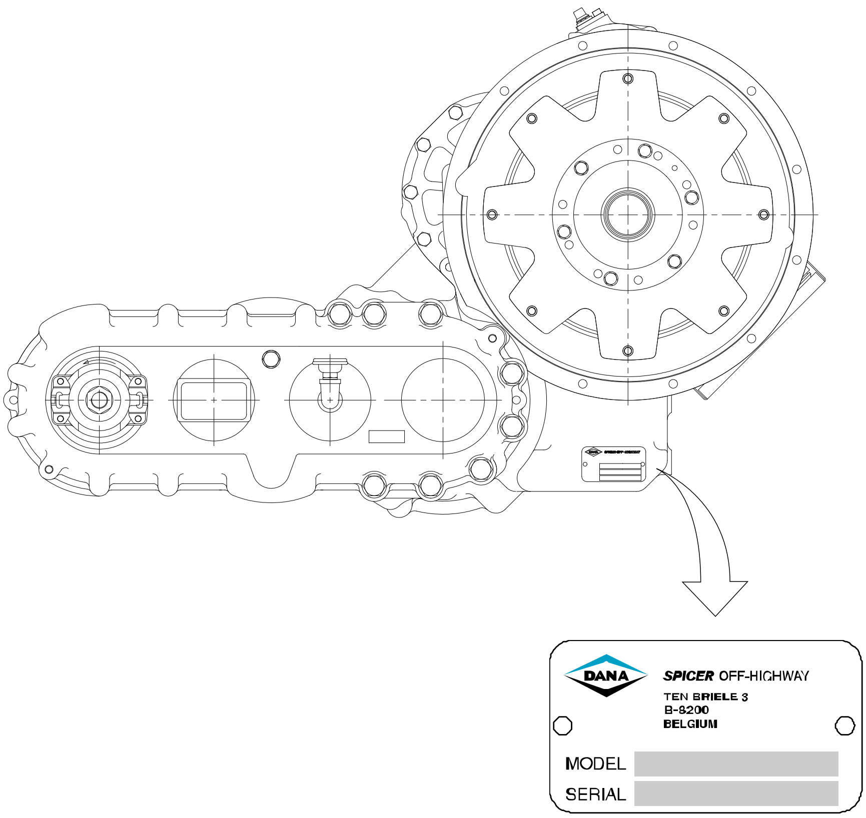
Inspect housings, covers and bearing caps to ensure that they are thoroughly clean and that mating surfaces, bearing bores, etc... are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions which would cause subsequent oil leaks or failures.

2.3 LEGEND SYMBOLS

	Smontaggio di sottogruppi Disassembly of assembly groups
	Montaggio di sottogruppi Reassemble to from assembly group
	Smontaggio di particollari ingombranti Remove obstruction parts
	Montaggio di particollari ingombranti Reinstall - remount parts which had obstructed disassembly
	Attenzione, indicazione importante Attention! important notice
	Controllare regolare p.e. coppie, misure, pressione etc. Check - adjust e.g. torque, dimensions, pressures etc.
	T = Attrezzature speciali P = Pagina T = Special tool P = Page
	Rispettare direzione di montaggio Note direction of installation
	Controllare esaminare controllo visuale Visual inspection
	Eventualimente riutilizzabile (sostituire se necessario) Possibly still serviceable, renew if necessary

	Sostituire con ogni montaggio Renew at each reassembly
	Togliere - mettere la sicura Unlock - lock e.g. split pin, locking plate, etc.
	Mettere la sicura, incollare (mastice liquido) Lock - adhere (liquid sealant)
	Evitare danni ai materiali, danni ai pezzi Guard against material damage, damage to parts
	Marchiari prima dello smontaggio (per il montaggio) Mark before disassembly, observe marks when reasembl.
	Carricare riempire (olio - lubrificante) Filling - topping up - refilling e.g. oil, cooling water, etc.
	Scarricare olio, lubrificante Drain off oil, lubricant
	Tendere Tighten - clamp ; tightening a clamping device
	Insere pressione nel circuito idraulico Apply pressure into hydraulic circuit
	Pulire To clean

3. TECHNICAL SPECIFICATIONS



3.1 IDENTIFICATION OF THE UNIT

1. Model and Type of the unit
2. Serial number

3.2 WEIGHT, DIMENSIONS, OIL CAPACITY

3.2.1 Transmission with a 3 shaft Drop Box

Weight (dry): ± 255 kg [562 Lbs.]

Max. lenght: 529.3 mm [20.84”]

Max. Width: 872.0 mm [34.33”]

Max. Heigth: 619.2 mm [24.38”]

Oil Capacity

Transmission: ± 13.5 l [3.6 US gallon]

(without cooler and hydraulic lines.

Consult Operator’s Manual on applicable machine for system capacity.)

Drop Box: ± 0.75 l [0.2 US gallon]

3.2.2 Transmission with a 4 shaft Drop Box

Weight (dry): ± 272 kg [600 Lbs.]

Max. lenght: 529.3 mm [20.84”]

Max. Width: 1007.2 mm [39.66”]

Max. Heigth: 619.2 mm [24.38”]

Oil Capacity

Transmission: ± 13.5 l [3.6 US gallon]

(without cooler and hydraulic lines.

Consult Operator’s Manual on applicable machine for system capacity.)

Drop Box: ± 1.0 l [0.26 US gallon]

NOTE:

THE OIL OF THE DROP BOX IS COMPLETELY SEPARATED FROM THE OIL OF THE TRANSMISSION.

3.3 TIGHTENING TORQUES

3.3.1 Torque specifications for lubricated or plated screw treads

NOM. SIZE	GRADE 5			
	FINE THREAD		COARSE THREAD	
	LBF - FT	[N.m]	LBF - FT	[N.m]
.2500	9 - 11	[12 - 15]	8 - 10	[11 - 14]
.3125	16 - 20	[22 - 27]	12 - 16	[16 - 22]
.3750	26 - 29	[35 - 39]	23 - 25	[31 - 34]
.4375	41 - 45	[56 - 61]	37 - 41	[50 - 56]
.5000	64 - 70	[87 - 95]	57 - 63	[77 - 85]
.5625	91 - 100	[123 - 136]	82 - 90	[111 - 122]
.6250	128 - 141	[174 - 191]	113 - 124	[153 - 168]
.7500	223 - 245	[302 - 332]	200 - 220	[271 - 298]

NOM. SIZE	GRADE 8			
	FINE THREAD		COARSE THREAD	
	LBF - FT	[N.m]	LBF - FT	[N.m]
.2500	11 - 13	[15 - 18]	9 - 11	[12 - 15]
.3125	28 - 32	[38 - 43]	26 - 30	[35 - 41]
.3750	37 - 41	[50 - 56]	33 - 36	[45 - 49]
.4375	58 - 64	[79 - 87]	52 - 57	[71 - 77]
.5000	90 - 99	[122 - 134]	80 - 88	[108 - 119]
.5625	128 - 141	[174 - 191]	115 - 127	[156 - 172]
.6250	180 - 198	[224 - 268]	159 - 175	[216 - 237]
.7500	315 - 347	[427 - 470]	282 - 310	[382 - 420]

NOM. SIZE	GRADE 8.8 or 9.8		GRADE 10.9	
	COARSE THREAD		COARSE THREAD	
	LBF - FT	[N.m]	LBF - FT	[N.m]
M10	30 - 37	[40 - 50]	44 - 48	[60 - 65]
M12	50 - 55	[65 - 75]	74 - 81	[100 - 110]
M16	125 - 140	[170 - 190]	177 - 203	[240 - 275]

3.3.2 Pipe plug torque chart

THREAD NPTF	TORQUE LBF - FT	[N.m]
1/16-27	5-7	[7-9]
1/8-27	7-10	[9-14]
1/4-18	15-20	[20-27]
3/8-18	25-30	[34-41]
1/2-14	30-35	[41-47]
3/4-10	40-45	[54-61]

3.3.3 Permanent metric plug torque chart

THREAD SIZE	TORQUE LBF - FT	[N.m]
M18 x 1.5 6H	25-30	[34-41]
M26 x 1.5 6H	45-50	[61-68]

4. MAINTENANCE

4.1 OIL SPECIFICATIONS

Both transmission and Drop Box use the same type of oil.

4.1.1 Recommended lubricants

1. Caterpillar	TO-4
2. John Deere	J20 C, D
3. Military	MIL-PRF-2104G
4. Allison	C-4
5. Dexron*	II Equivalent - See note below

Note:

Dexron* II Equivalent is acceptable; However it is not compatible with torque converters or transmissions equiped with graphitic friction material clutch plates.

Caution:

Dexron* III, Engine oil or GL-5 oils are not recommended.

PREFERRED OIL VISCOSITY

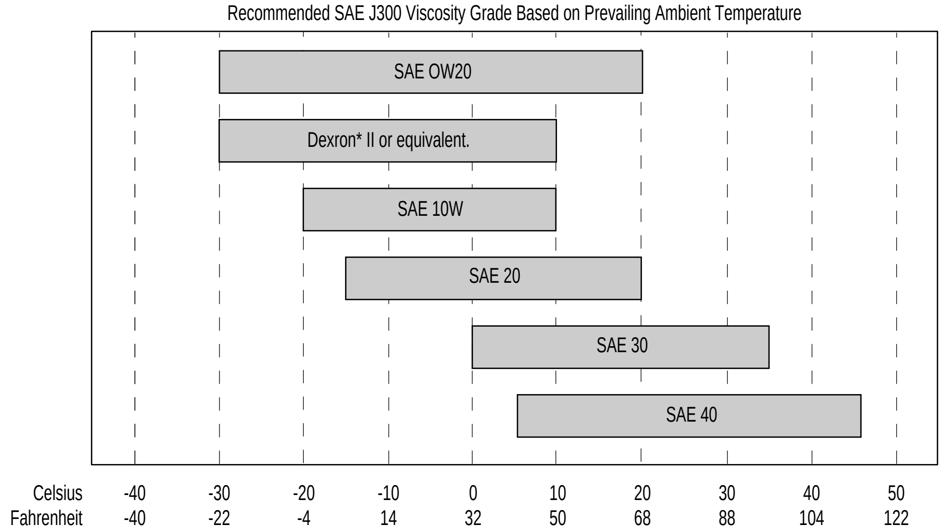
It is recommended that the highest viscosity monograde lubricant available be used for the anticipated ambient temperature. Typically this will be a CAT TO-4 qualified lubricant. When large swings in ambient temerature are possible, J20 C, D multigrades are recommended. Multigrade lubricants should be applied at the lower viscosity rating for the prevailing ambient temperature, i.e. a 10W20 should be used where a 10W monograde is used. If a C-4 multigrade is used instead of J20 lubricant it is recommended that the viscosity spans no more than 10 points, i.e. 10W20.

Caution:

synthetic lubricants are approved if qualified by one of the above specifications.
oil viscosity guidelines apply, but synthetic multigrades may span more than 10 points.

for fire resistant fluid recommendations please contact **SPICER OFF-HIGHWAY PRODUCTS**.

Recommended SAE J300 Viscosity Grade Based on Prevailing Ambient Temperature



NORMAL OIL CHANGE INTERVAL

Drain and refill system every 1000 hours of average environmental and duty cycle conditions. Severe or sustained high operating temperature or very dusty atmospheric conditions will result in accelerated deterioration or contamination. Judgement must be used to determine the required change intervals for extreme conditions.

EXTENDED OIL CHANGE INTERVAL

Extended oil service life may result when using synthetic fluids. Appropriate change intervals should be determined for each transmission by measuring oil oxidation and wear metals over time, to determine a baseline. Wear metal analysis can provide useful information, but a transmission should not be removed from service based solely on this analysis.

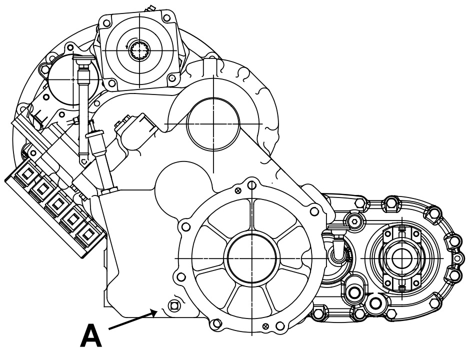
* Dexron is a registered trademark of GENERAL MOTORS CORPORATION.

4.2 MAINTENANCE INTERVALS FOR THE TRANSMISSION.

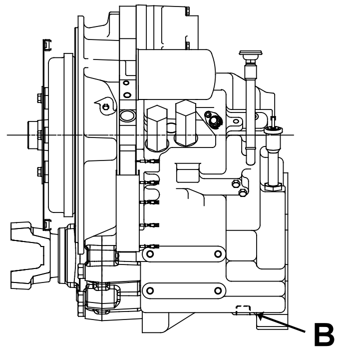
NOTE:

TO DRAIN THE TRANSMISSION, BOTH DRAIN PLUGS (A & B) NEED TO BE REMOVED

- 3 shaft drop box

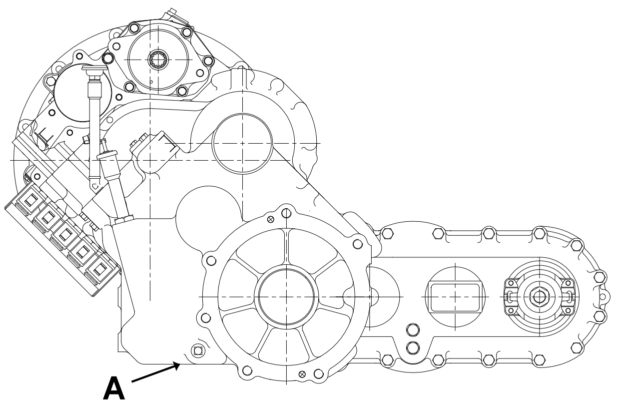


REAR VIEW

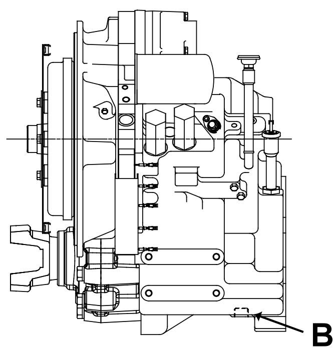


LEFT VIEW

- 4 shaft drop box



REAR VIEW



LEFT VIEW

4.3 MAINTENANCE INTERVALS FOR THE 3 & 4 SHAFT DROP BOX

4.3.1 Daily

Check oil level daily.
Maintain oil level at full mark. (Middle of oil level glass)

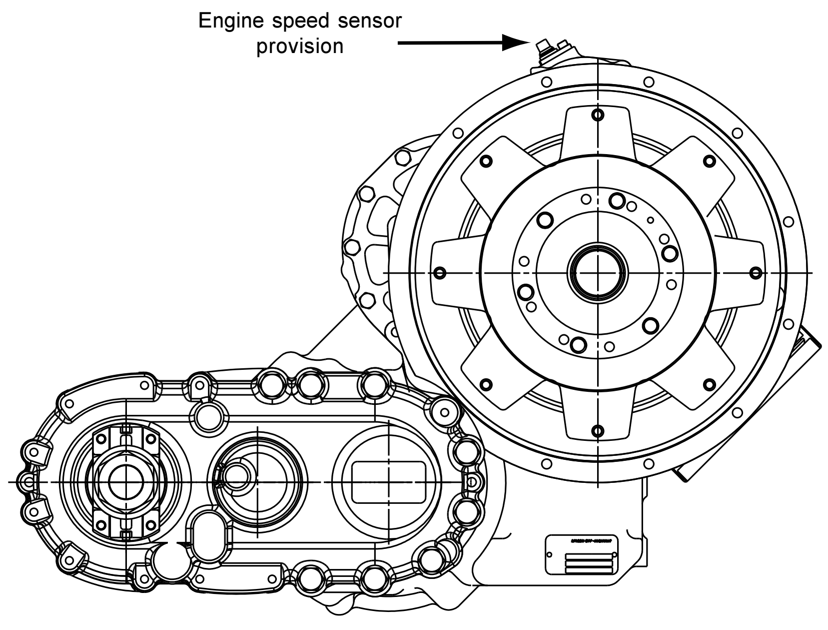
4.3.2 Normal drain period

Normal drain period is every 1000 hours for average environment and duty cycle condition.
Severe or sustained high operating temperature or very dusty atmospheric conditions will cause accelerated deterioration and contamination.
For extreme conditions judgement must be used to determine the required change intervals.

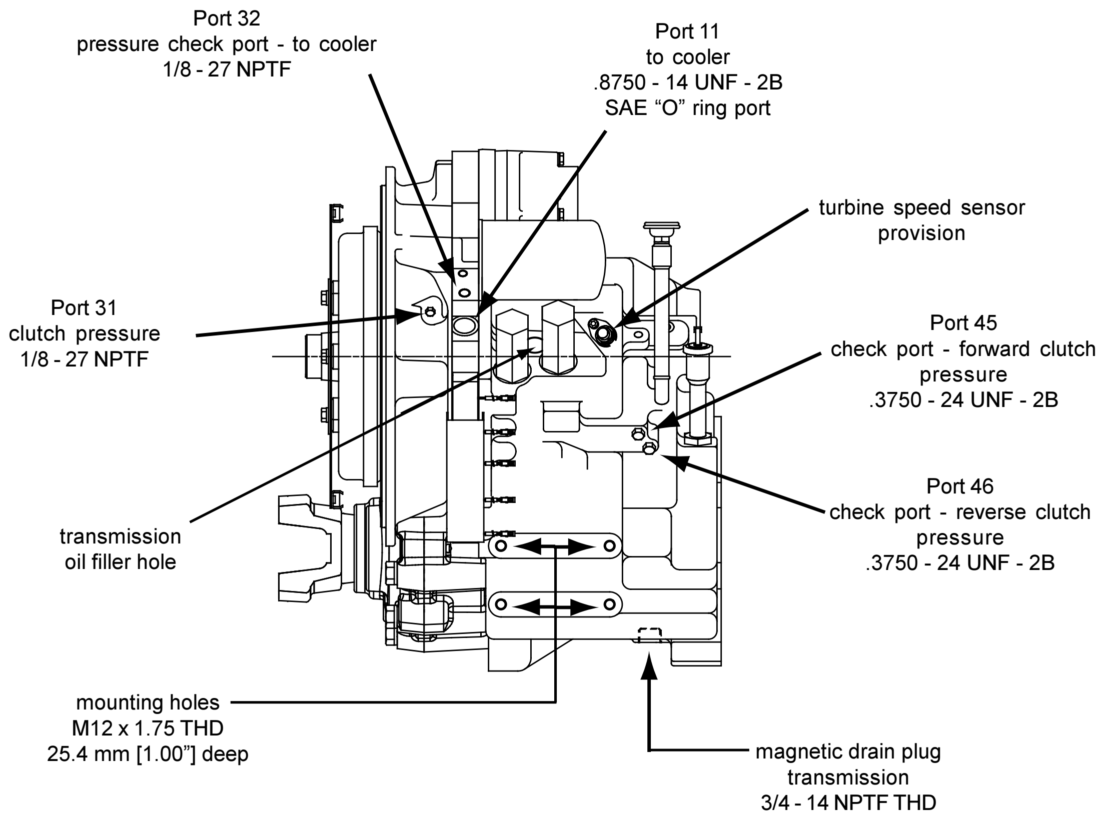
5 TROUBLESHOOTING GUIDE

5.1 CHECK POINTS

5.1.1 Transmission with a 3 shaft drop box



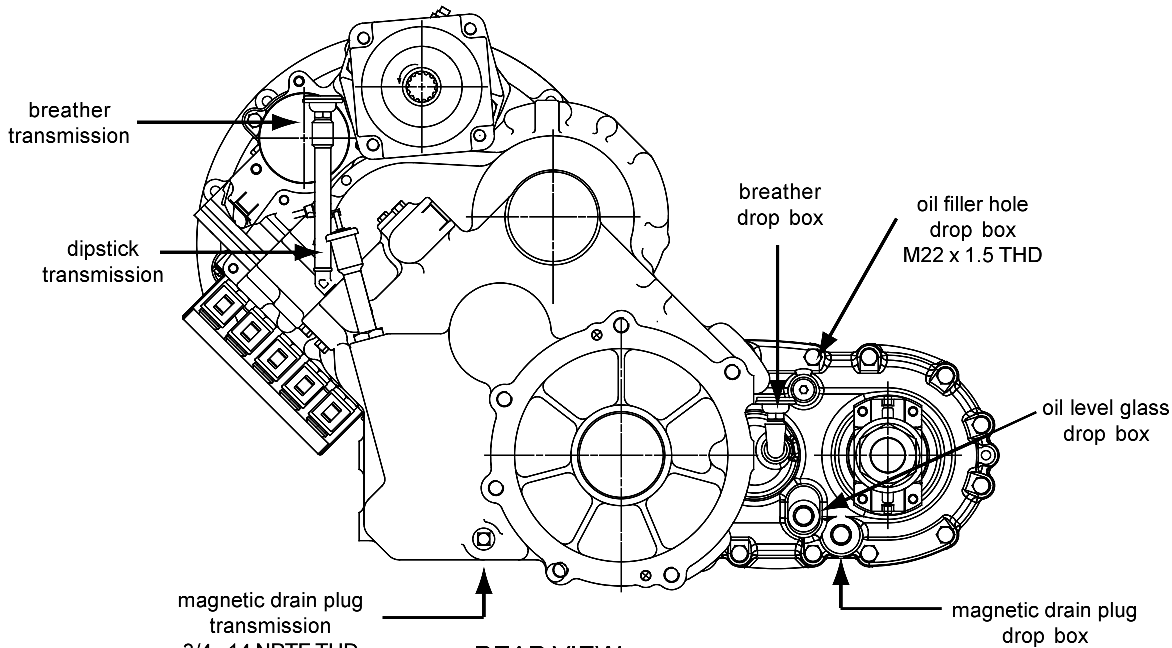
FRONT VIEW



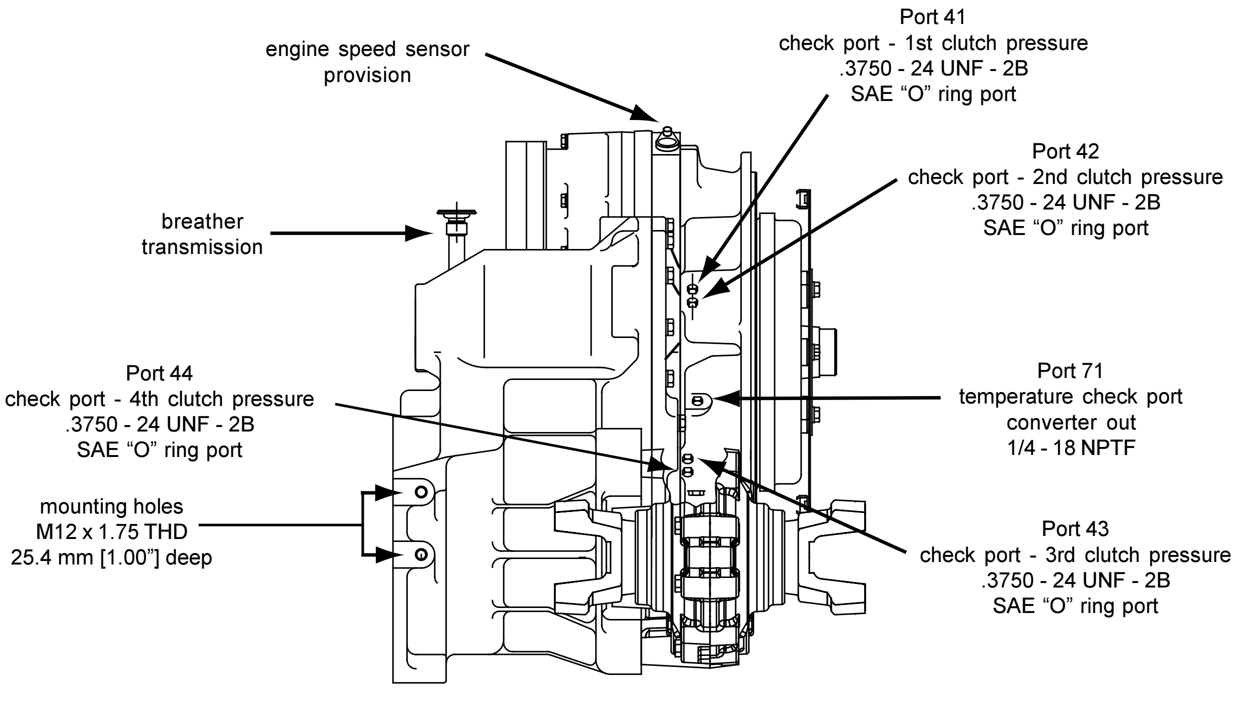
LEFT SIDE VIEW

5.1 CHECK POINTS (CONTINUED)

5.1.2 Transmission with a 3 shaft drop box



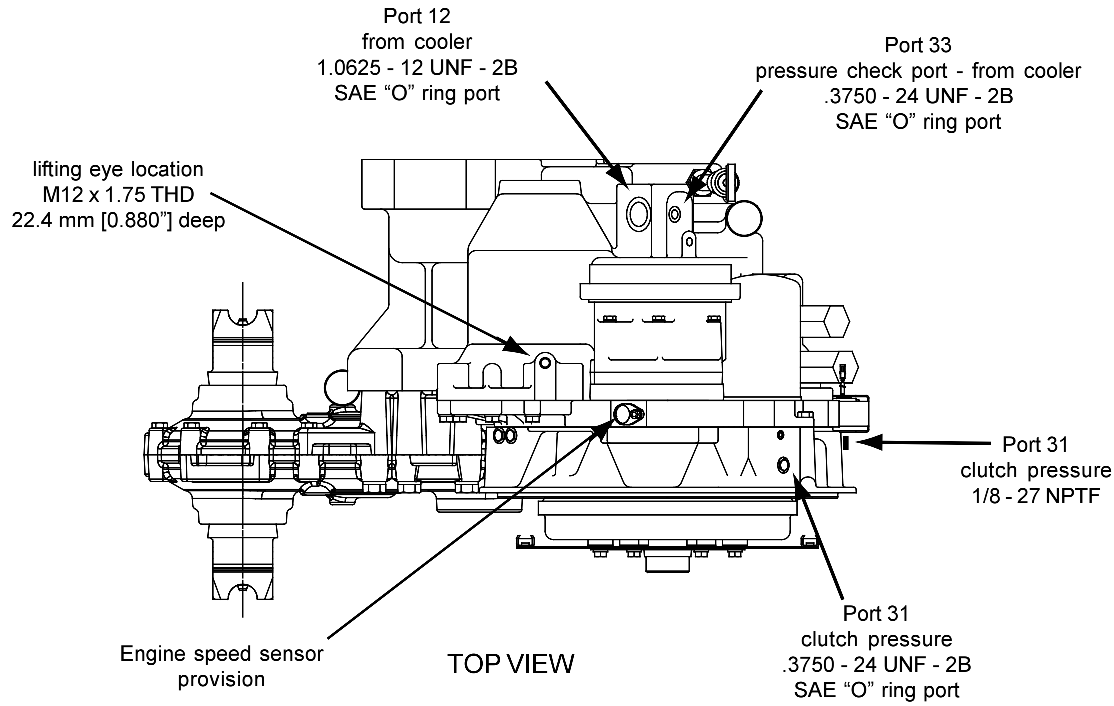
REAR VIEW



RIGHT SIDE VIEW

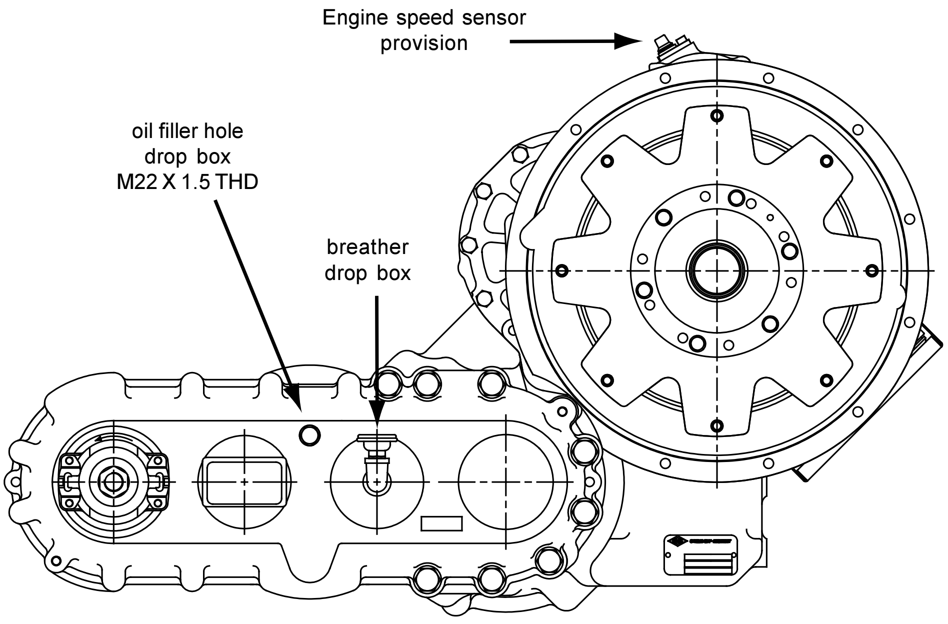
5.1 CHECK POINTS (CONTINUED)

5.1.3 Transmission with a 3 shaft drop box

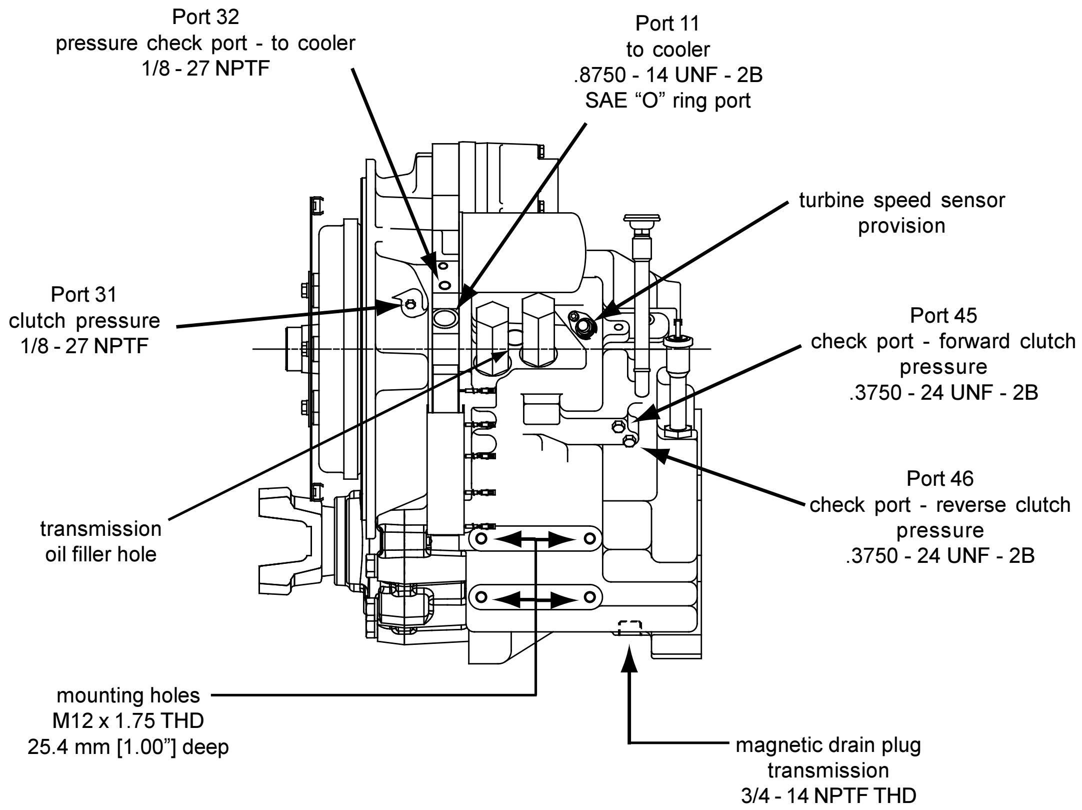


5.1 CHECK POINTS (CONTINUED)

5.2.1 Transmission with a 4 shaft drop box



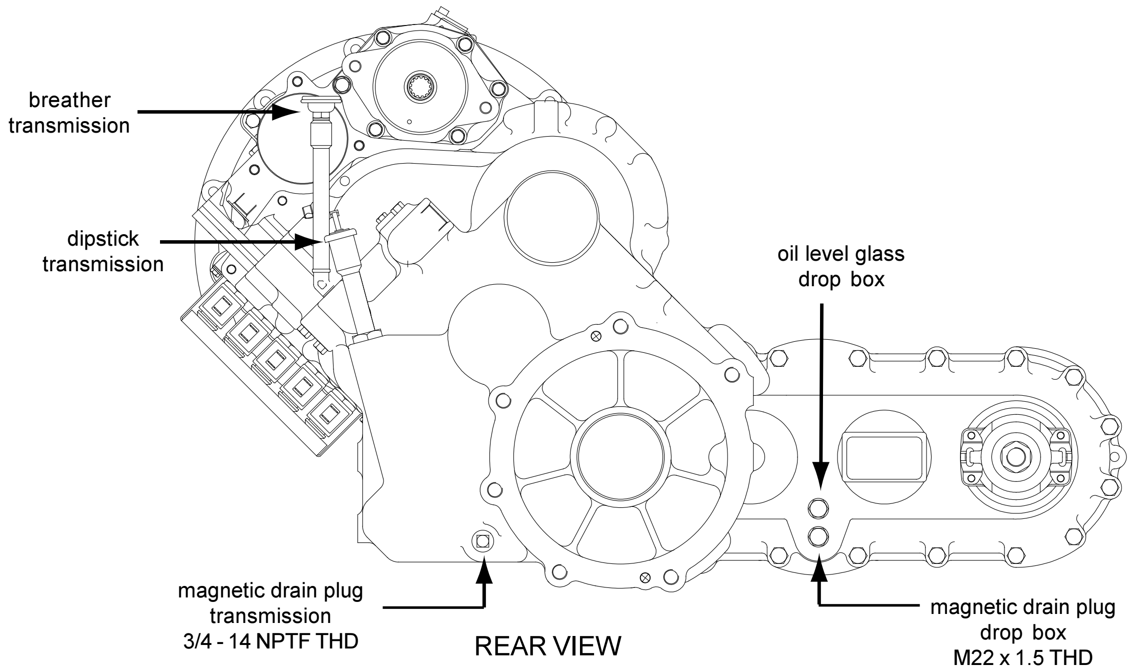
FRONT VIEW

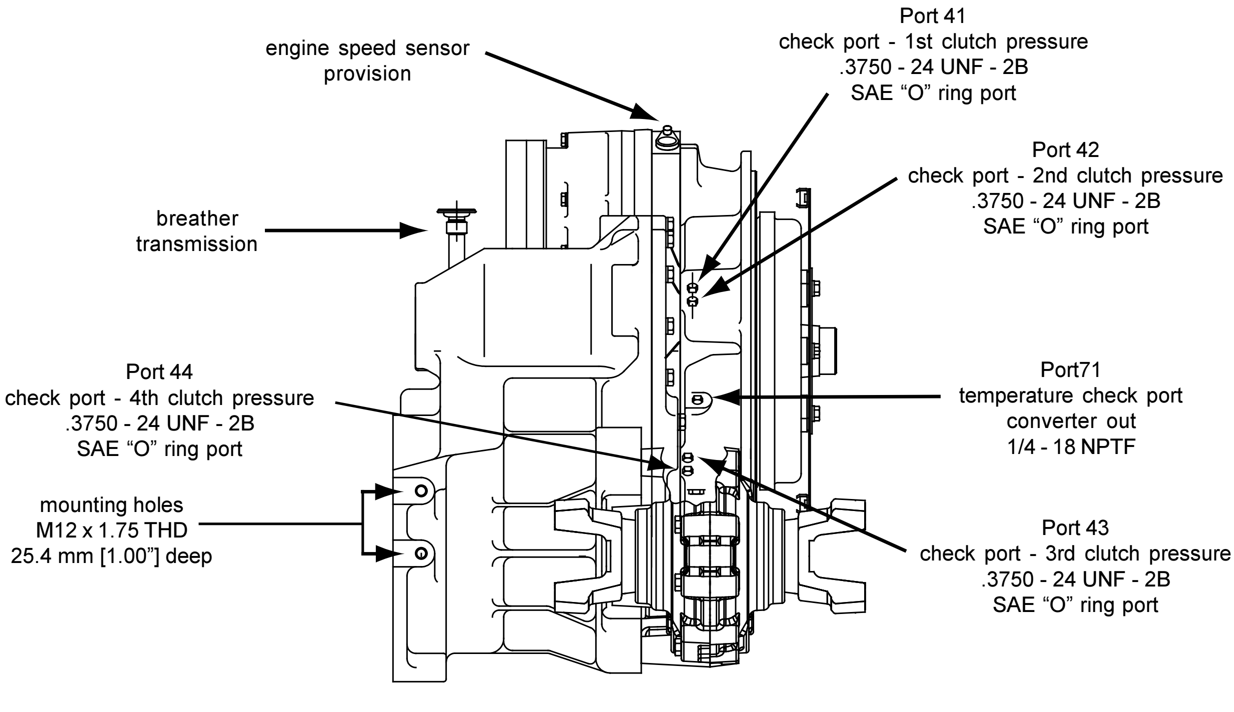


LEFT SIDE VIEW

5.1 CHECK POINTS (CONTINUED)

5.2.2 Transmission with a 4 shaft drop box

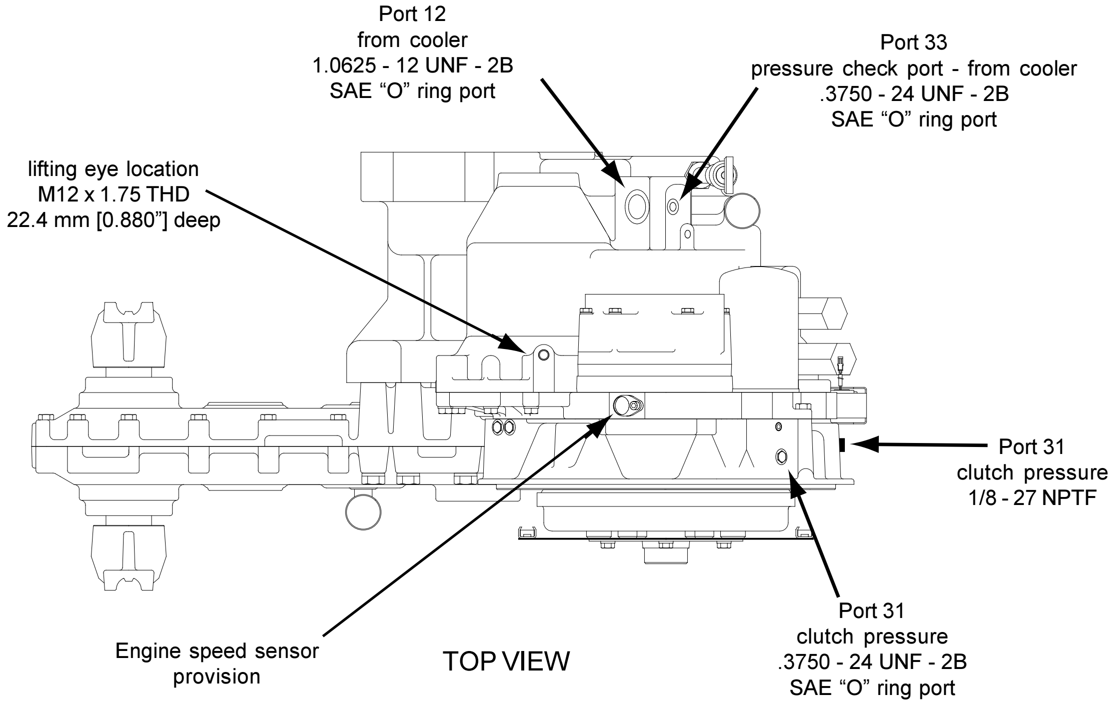




RIGHT SIDE VIEW

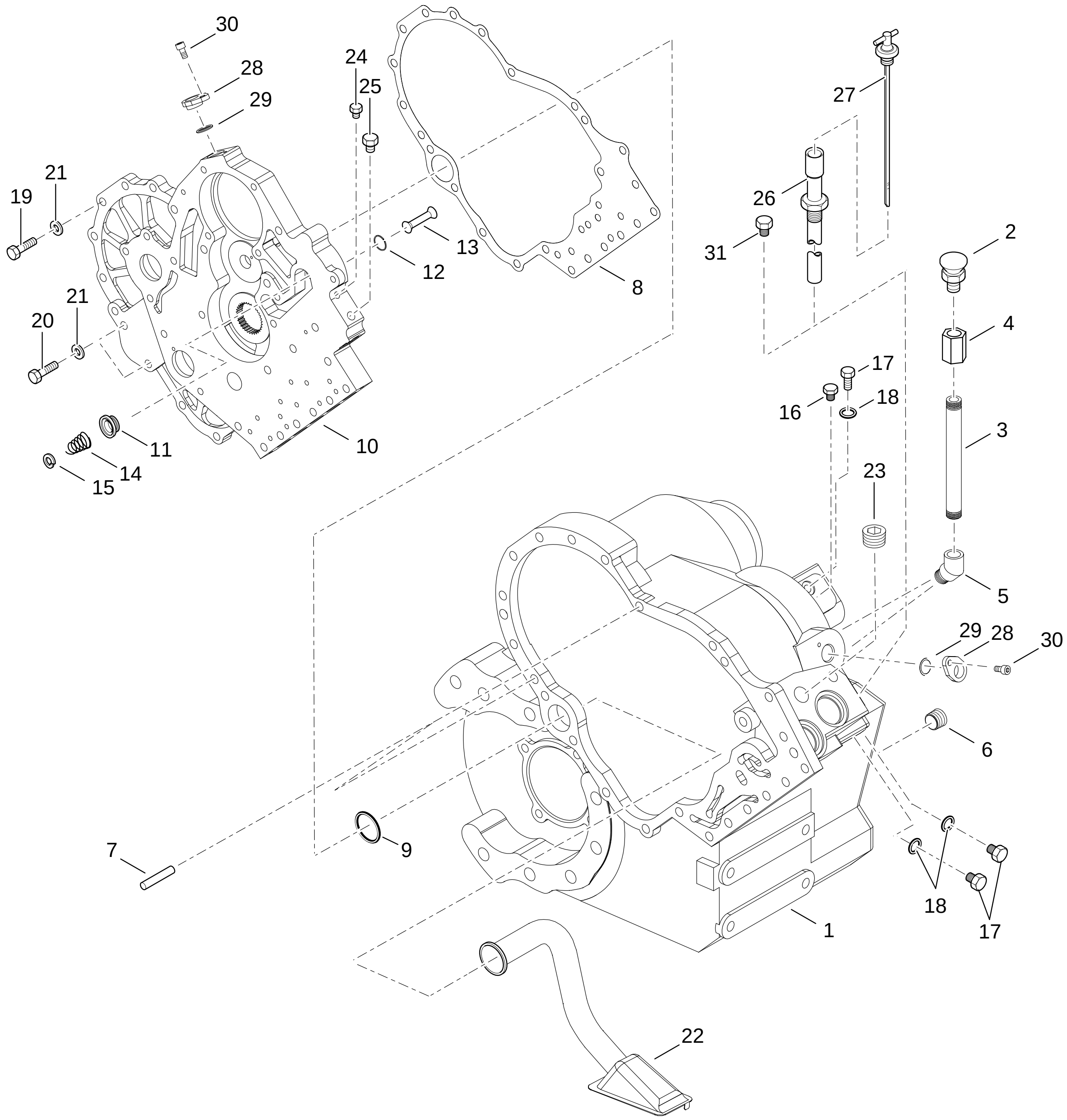
5.1 CHECK POINTS (CONTINUED)

5.2.3 Transmission with a 4 shaft drop box



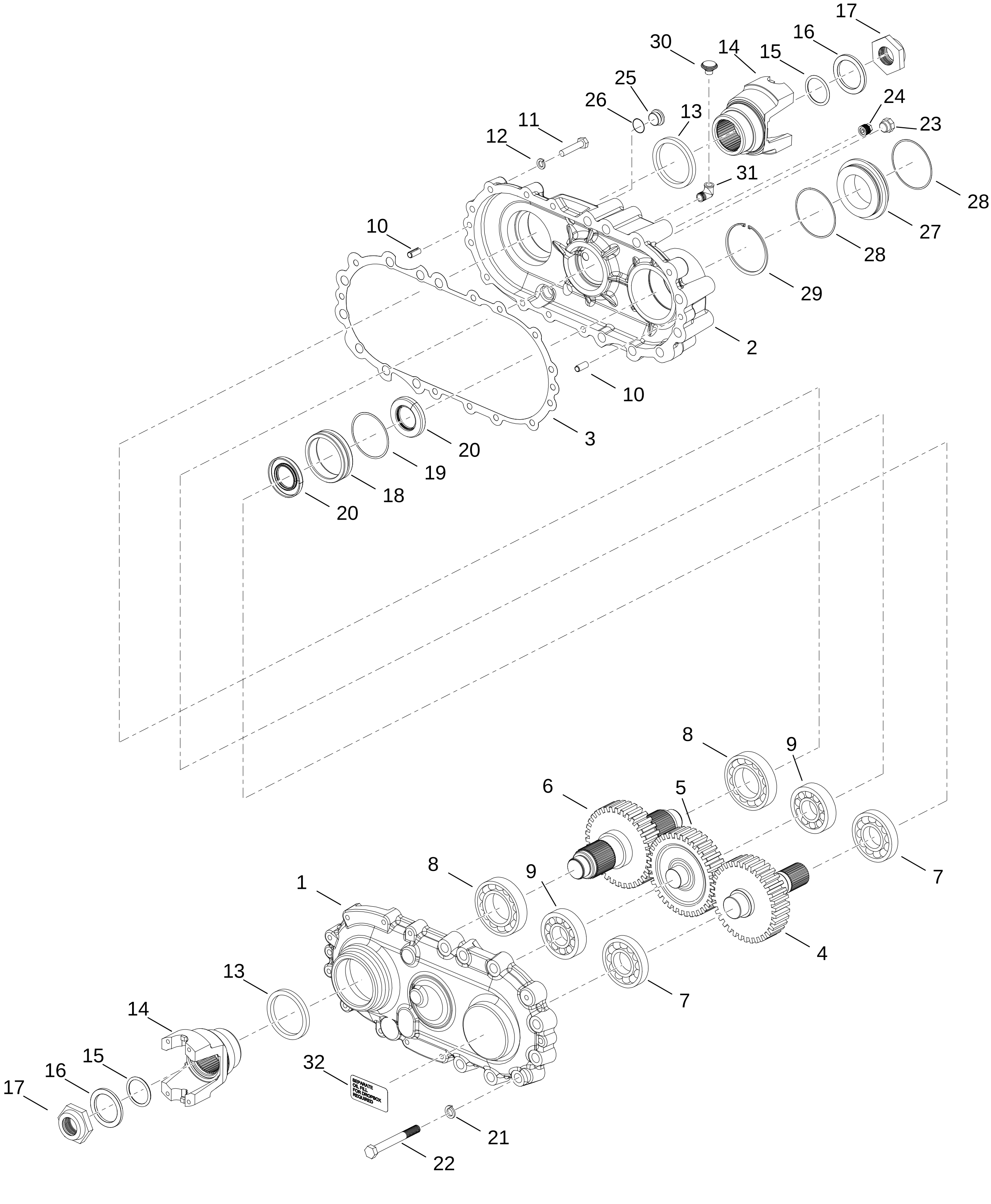
6. SECTIONAL VIEWS AND PARTS IDENTIFICATION

TRANSMISSION CASE & PLATE GROUP



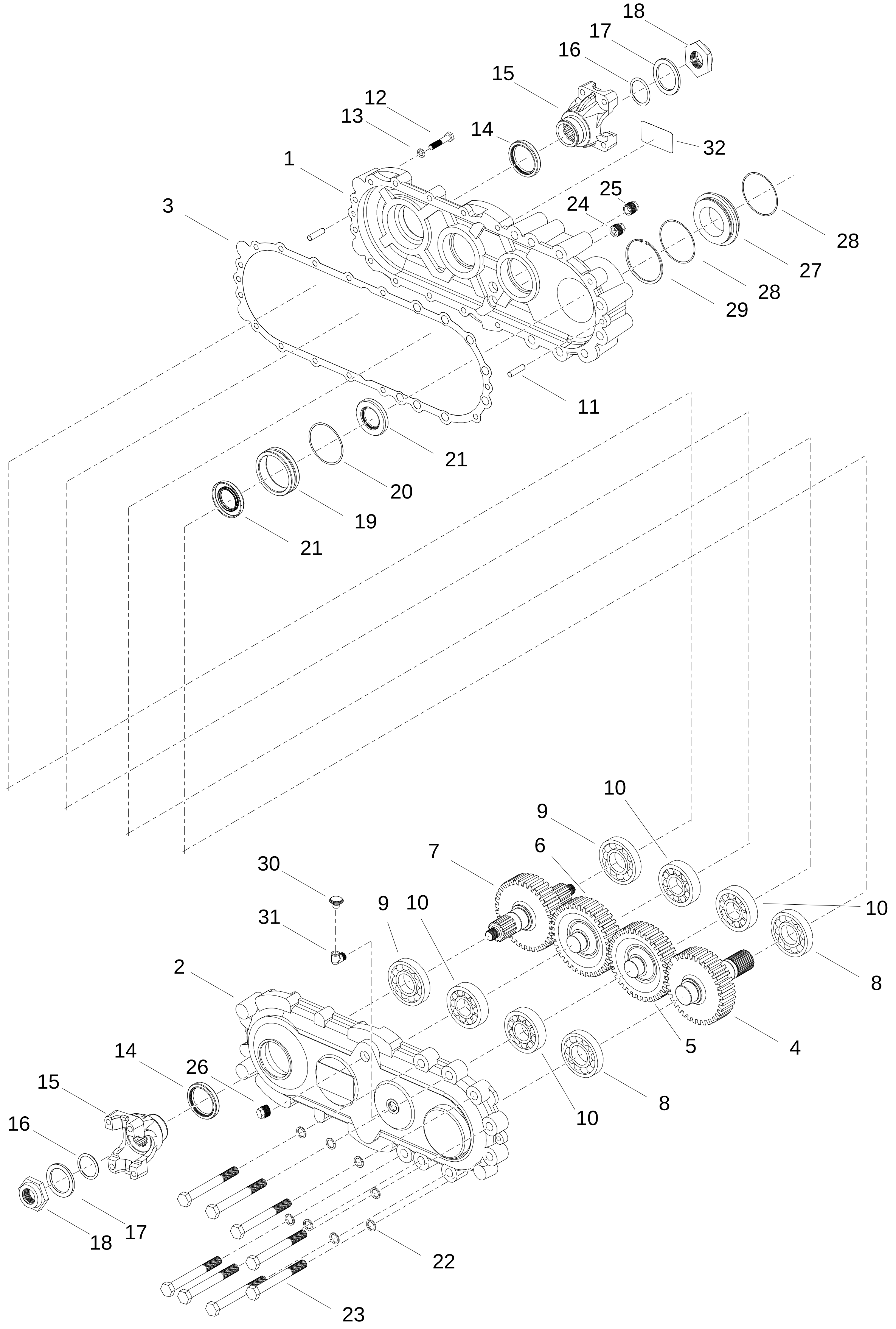
Item	Description	Qty
1	Case - Transmission	1
2	Breather - Air	1
3	Nipple Pipe	1
4	Coupling - Pipe	1
5	Fitting - Elbow	1
6	Plug - Magnetic drain	2
7	Pin - Plate to transmission case dowel	2
8	Gasket - Plate to transmission case	1
9	Ring - Oil supply tube seal	1
10	Plate - Spacer	1
11	Seat - Safety valve	1
12	Snapring - Seat	1
13	poppet - Converter safety valve	1
14	Spring - Converter safety valve	1
15	Washer - Puppet retaining	1
16	Plug	1
17	Plug	3
18	"O" ring - Plug	3
19	Screw - Plate to transmission case	7
20	Screw - Plate to transmission case	2
21	Lockwasher - Plate to transmission	9
22	Assembly - Tube & screen	1
23	Plug -Filler	1
24	Plug	1
25	Plug	1
26	Assembly - Dipstick tube	1
27	Dipstick	1
28	Plug - Speed sensor port	2
29	"O" ring - Speed sensor port plug	2
30	Screw - Speed sensor port plug	2

3 SHAFT DROP BOX GROUP



Item	Description	Qty
1	Cover - Drop box front	1
2	Cover - Drop box rear	1
3	Gasket - Rear to front cover	1
4	Shaft - Drop box input	1
5	Gear - Drop box idler	1
6	Shaft - Drop box output	1
7	Bearing - Drop box input shaft	2
8	Bearing - Drop box output shaft	2
9	Bearing - Drop box idler shaft	2
10	Pin - Dowel	2
11	Screw - Rear cover to front cover	10
12	Lockwasher - Rear cover to front cover screw	10
13	Seal - Drop box output shaft oil	2
14	Flange - Output	2
15	"O" ring - Output flange	2
16	Washer - Output flange	2
17	Nut - Output flange	2
18	Sleeve - Oil seal	1
19	"O" ring - Oil seal sleeve	1
20	Seal - Oil seal sleeve oil	2
21	Lockwasher - Drop box mounting screw	8
22	Screw - Drop box mounting	8
23	Glass - Oil level	1
24	Plug - Magnetic drain	1
25	Plug	1
26	"O" ring - Plug	1
27	Sleeve - Pilot	1
28	"O" ring - Sleeve	2
29	Ring - Retaining	1
30	Breather - Air	1
31	Fitting - Elbow 90° street	1
32	Sticker	1

4 SHAFT DROP BOX GROUP

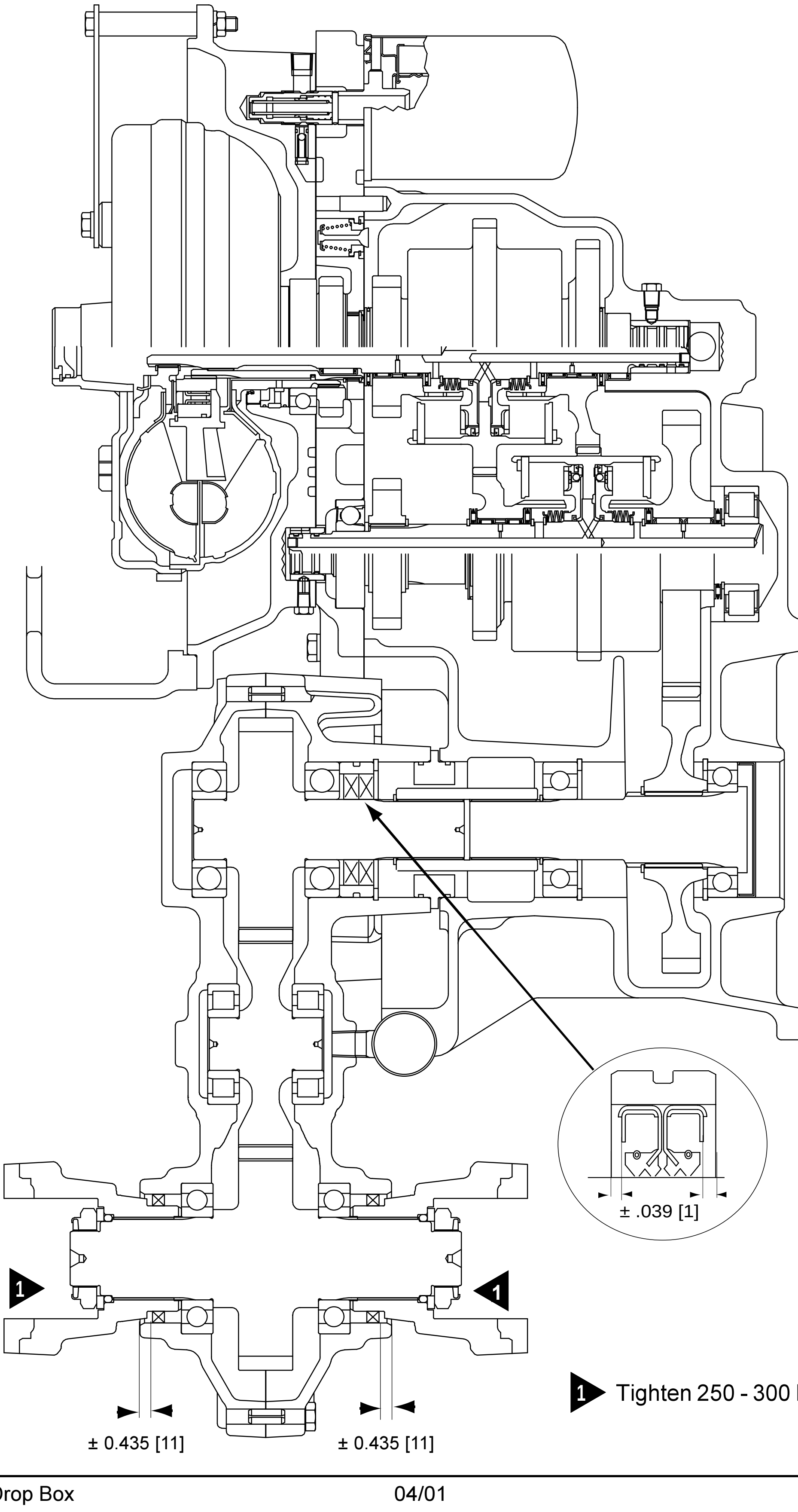


Item	Description	Qty
1	Cover - Drop box rear	1
2	Cover - Drop box front	1
3	Gasket - Rear to front cover	1
4	Shaft - Drop box input	1
5	Shaft - Drop box idler	1
6	Shaft - Drop box idler	1
7	Shaft - Drop box output	1
8	Bearing - Drop box input shaft	2
9	Bearing - Drop box output shaft	2
10	Bearing - Drop box idler shaft	4
11	Pin - Dowel	2
12	Screw - Rear cover to front cover	13
13	Lockwasher - Rear cover to front cover screw	13
14	Seal - Drop box output shaft	2
15	Flange - Output	2
16	“O” ring - Output flange	2
17	Washer - Output flange	2
18	Nut - Output flange	2
19	Sleeve - Oil seal	1
20	“O” ring - Oil seal sleeve	1
21	Seal - Oil seal sleeve oil	1
22	Lockwasher - Drop box mounting screw	8
23	Screw - Drop box mounting	8
24	Plug - Magnetic drain	1
25	Glass - Oil level	1
26	Plug	1
27	Sleeve - Pilot	1
28	“O” ring - Sleeve	2
29	Ring - Retaining	1
30	Breather - Air	1
31	Fitting - Elbow 90° street	1
32	Sticker	1

7. ASSEMBLY INSTRUCTIONS

7. ASSEMBLY INSTRUCTIONS

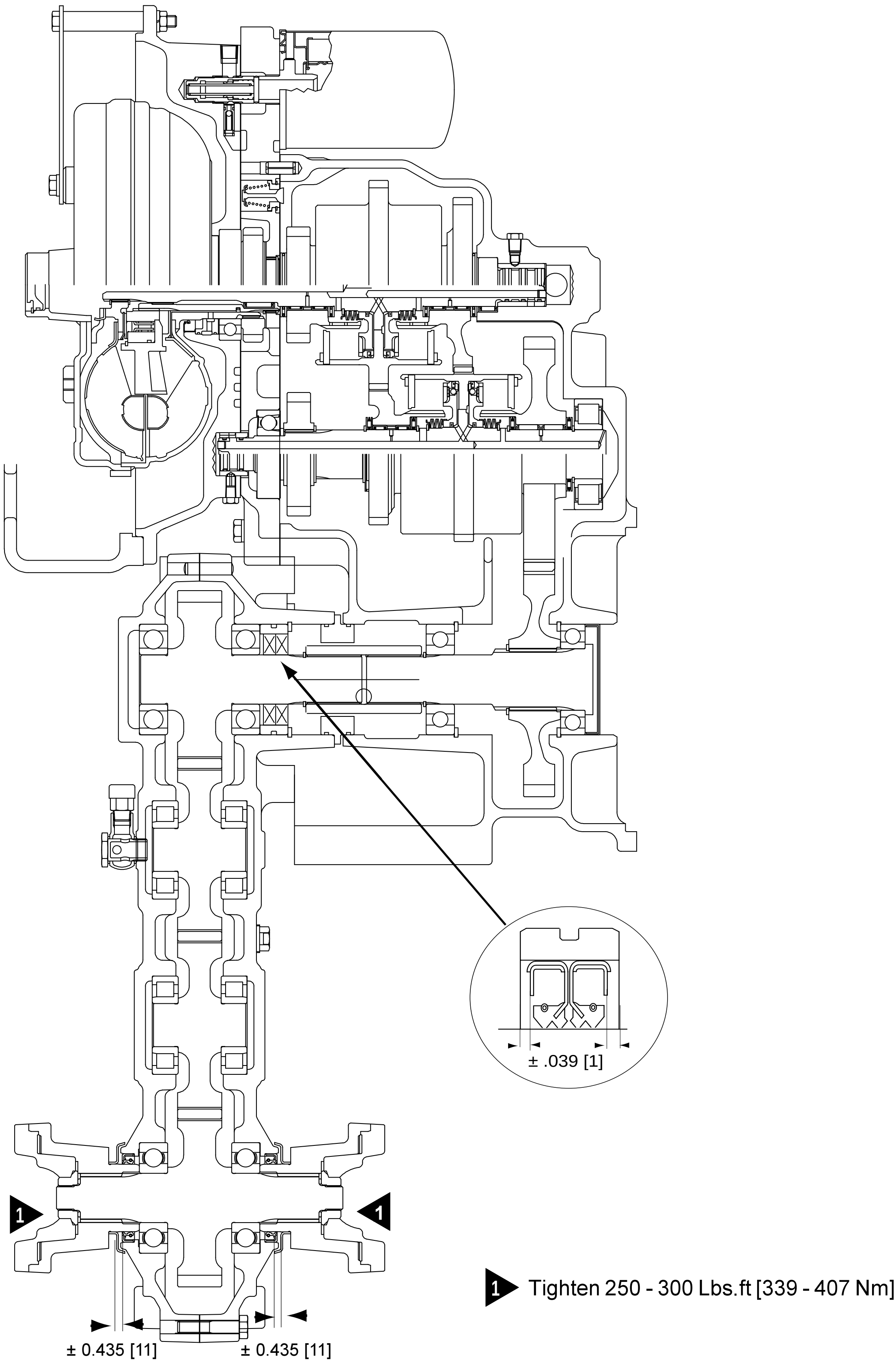
3 Shaft Drop Box



1 Tighten 250 - 300 Lbs.ft [339 - 407 Nm]

7. ASSEMBLY INSTRUCTIONS (CONTINUED)

4 Shaft Drop Box



8 DISASSEMBLY AND REASSEMBLY 3 & 4 SHAFT DROP BOX

Note:

This section shows disassembly and reassembly of a 4 shaft drop box. The procedure is also valid for the 3 shaft drop box as it has only one idler gear and shaft, whereas the 4 shaft drop box has two.

Disassembly of 4 shaft drop box

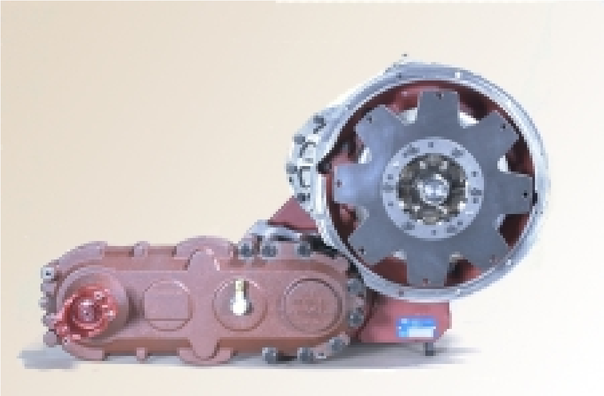


Figure 1
Front view of 4 shaft drop box.

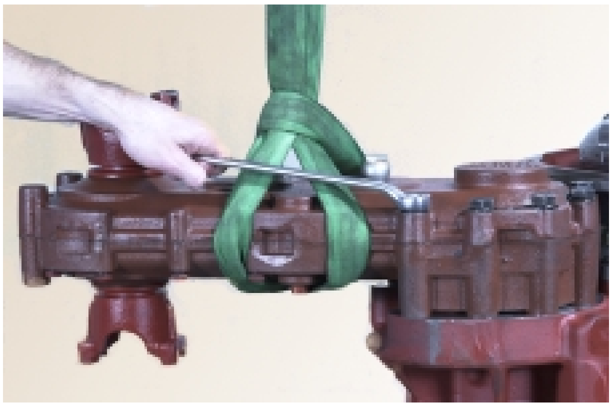


Figure 2
Support box with chain hoist. Remove drop box mounting screws and lockwashers.

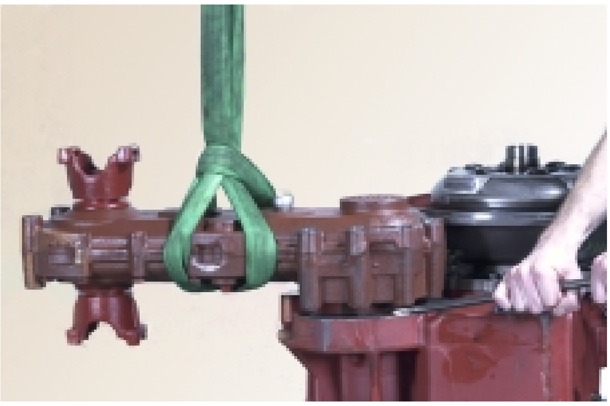


Figure 3
Pry box from transmission housing.

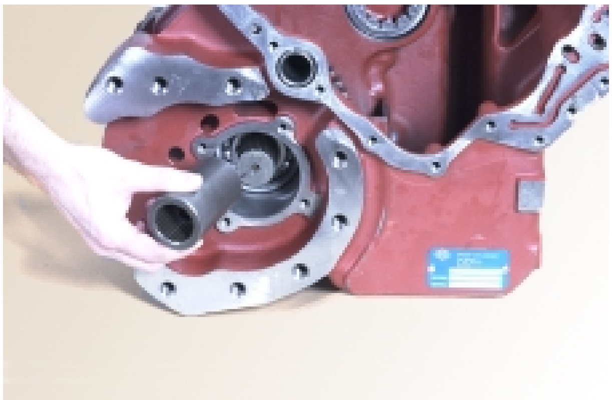


Figure 4
Remove coupling sleeve.

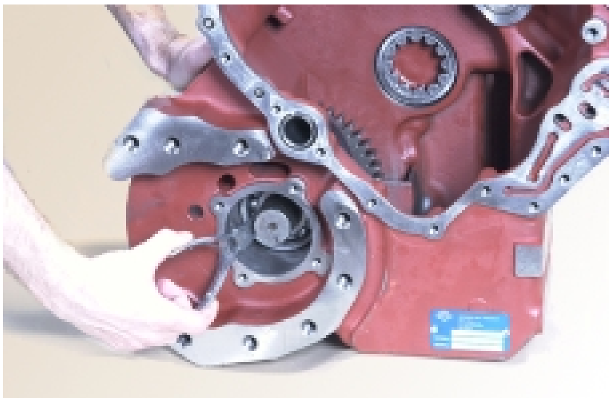


Figure 5
Remove output shaft front bearing retaining ring.

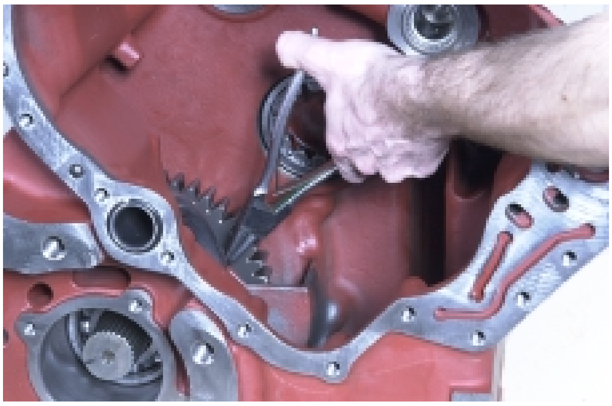


Figure 6
Remove output gear retaining ring.

Disassembly of 4 shaft drop box

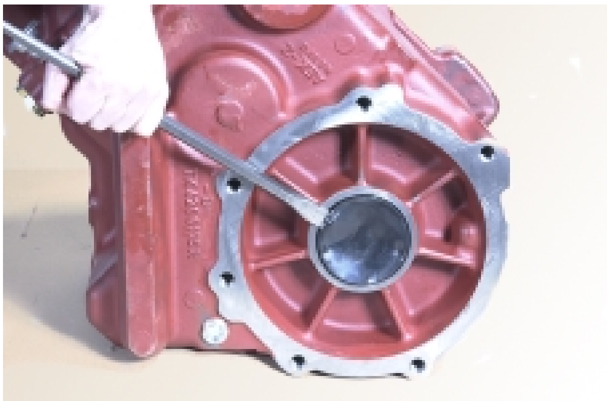


Figure 7

From the rear, remove output shaft bore plug.

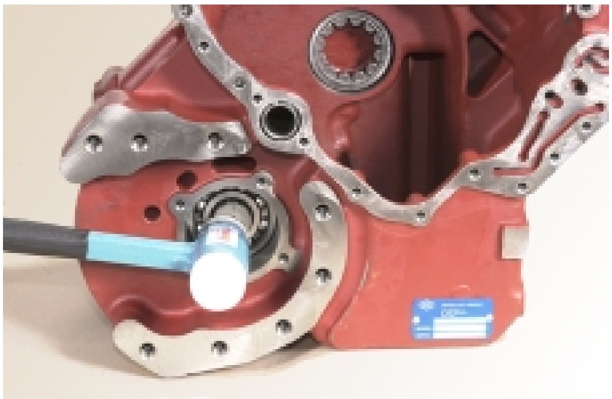


Figure 8

From the front tap output shaft and rear bearing from housing.

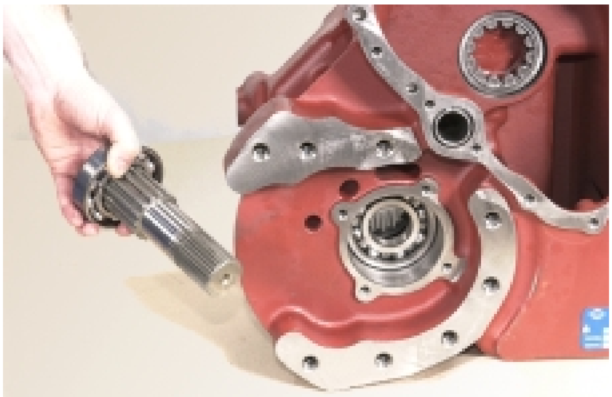


Figure 9

Output shaft and rear bearing removed.

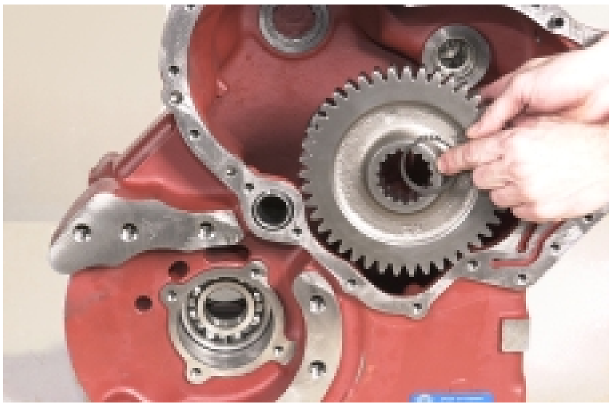


Figure 10

Remove output shaft gear and retaining ring.

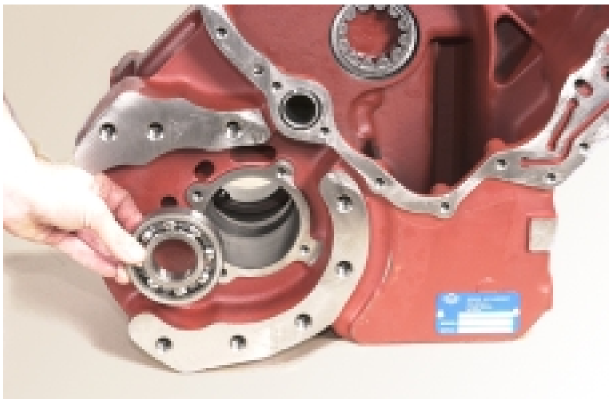


Figure 11

Remove output shaft front bearing.

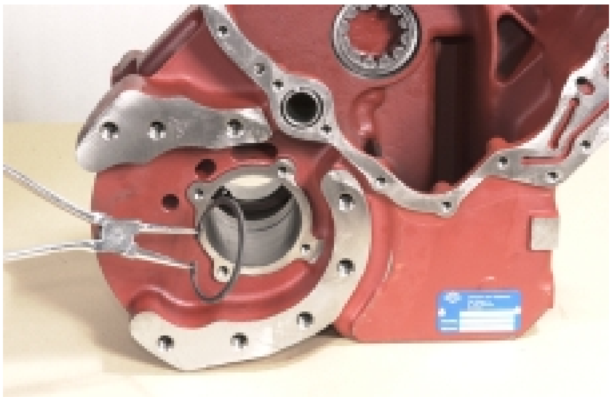


Figure 12

Remove output shaft front bearing retaining ring.

Disassembly of 4 shaft drop box

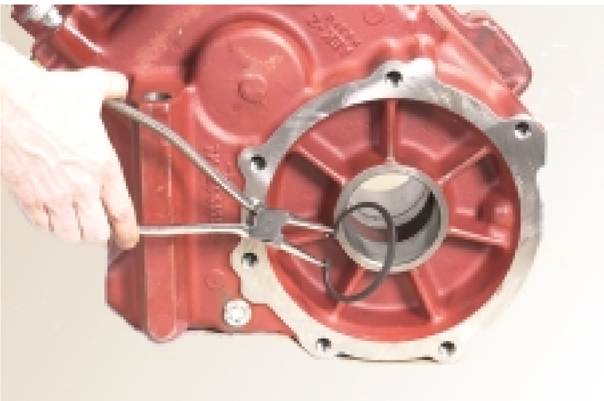


Figure 13

From the rear, remove rear bearing retaining ring.

Disassembly of 4 shaft drop box

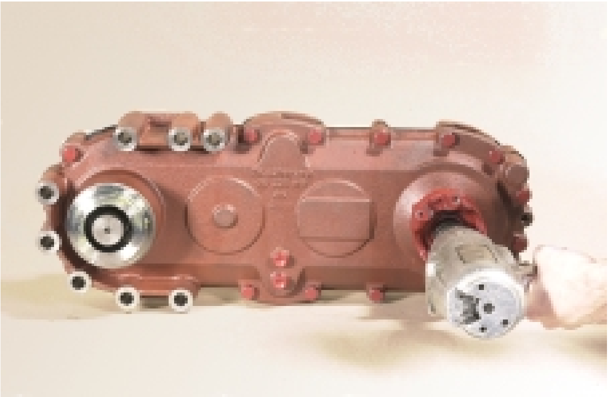


Figure 14
Use an impact wrench to loosen flange nut.

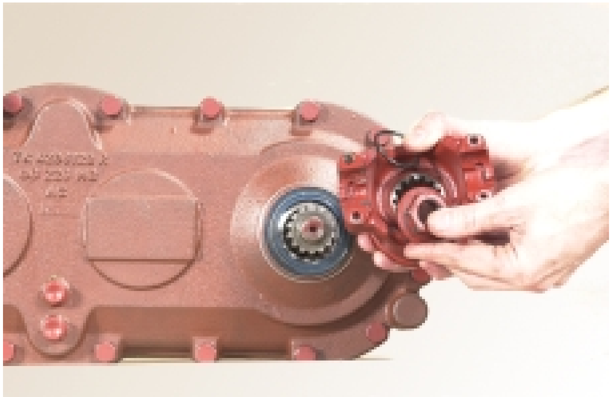


Figure 15
Output flange (rear) “O” ring, washer and nut removed.

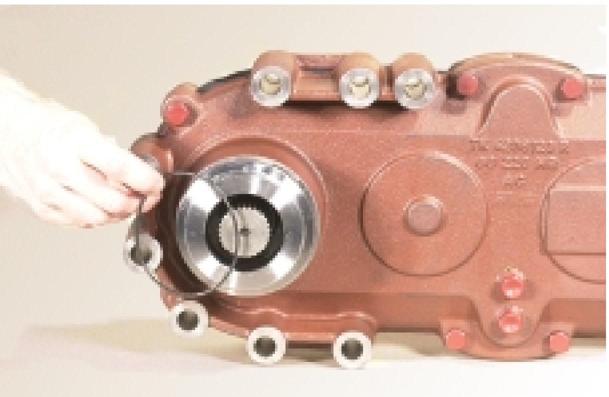


Figure 16
Remove sleeve outer “O” ring.

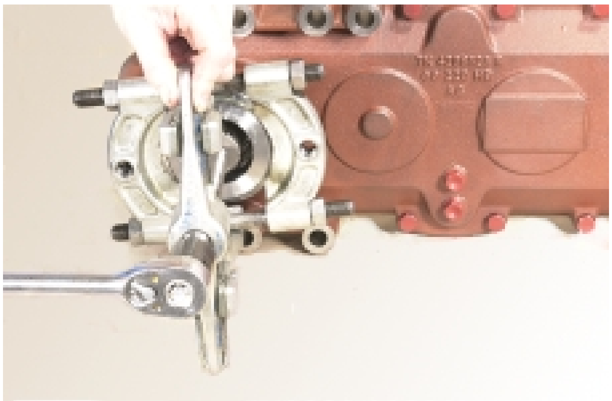


Figure 17
Use a gear puller to remove pilot sleeve.



Figure 18
Pilot sleeve and inner “O” ring removed.

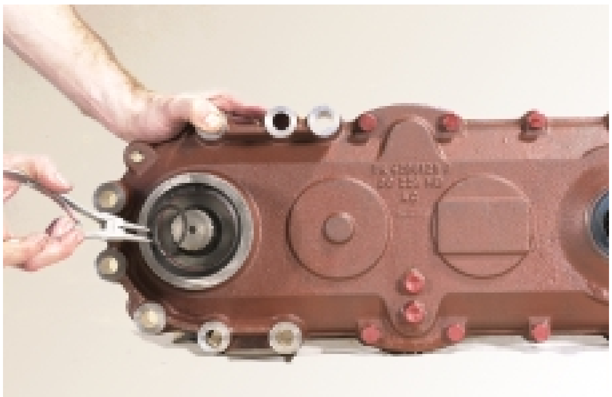


Figure 19
Remove coupling sleeve retaining ring.



Figure 20

Use an impact wrench to loosen flange nut.

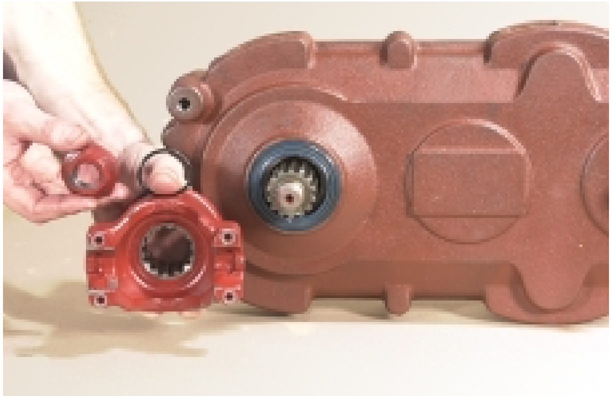


Figure 21

Output flange (front) “O” ring, washer and nut removed.

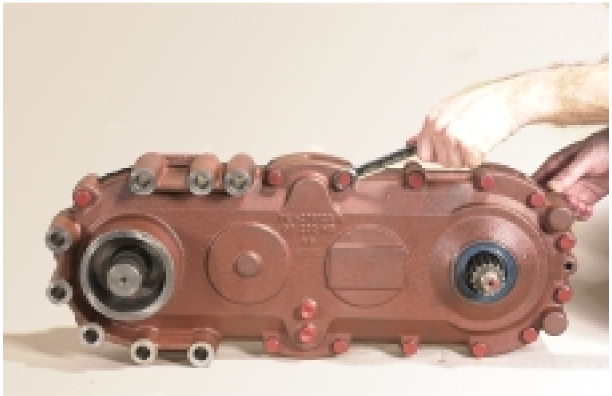


Figure 22

Remove front to rear cover screws and lockwashers.



Figure 23

Support front cover with a chain hoist. Pry front cover from rear cover.

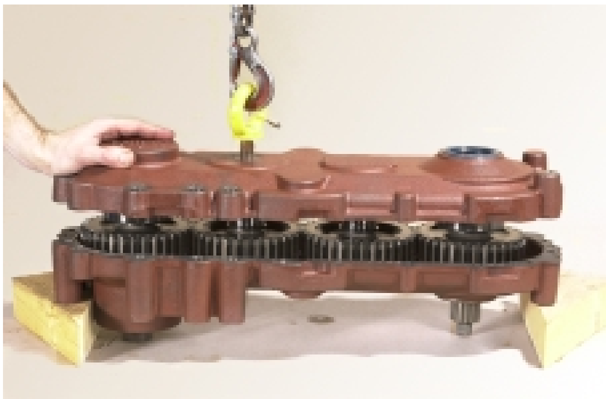


Figure 24

Front cover removed.

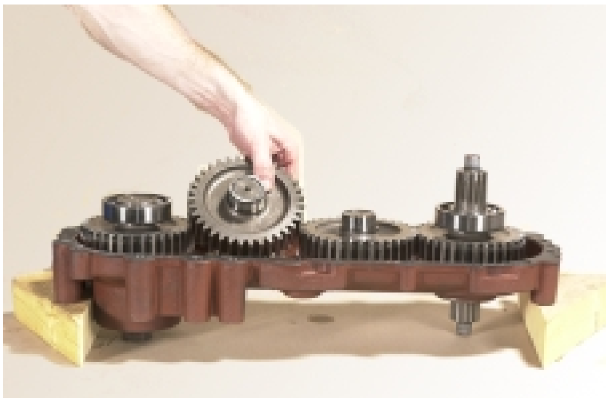


Figure 25

Remove idler shaft and gear.

Disassembly of 4 shaft drop box

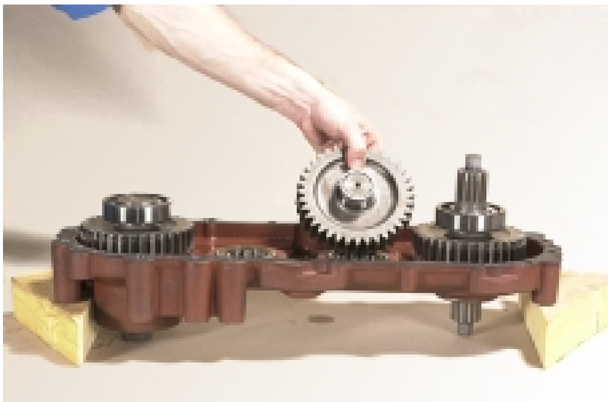


Figure 26
Remove idler shaft and gear.



Figure 27
Pry input assembly from cover.

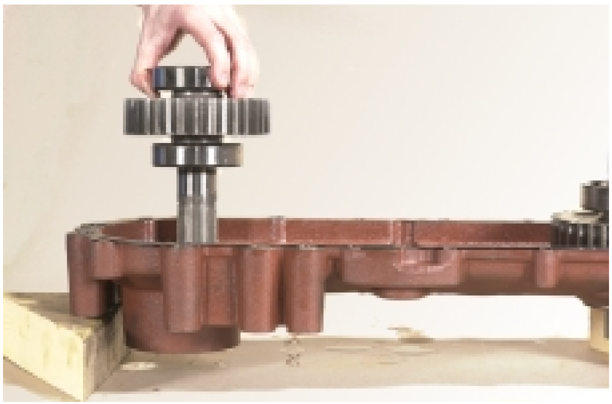


Figure 28
Input shaft assembly removed.

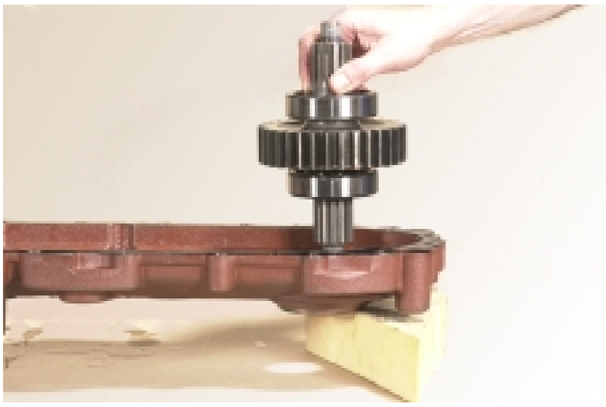


Figure 29
Output shaft assembly removed.

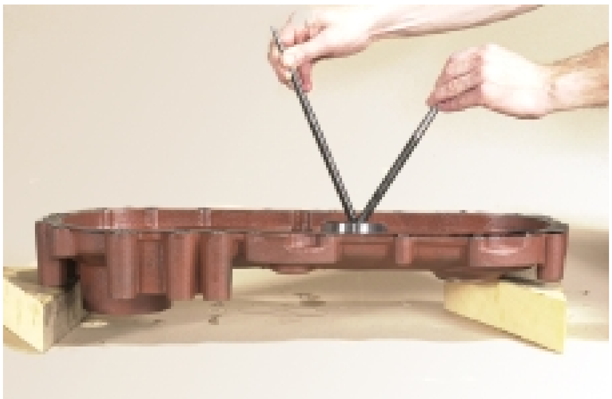


Figure 30
If bearing outer races have to be replaced, remove outer races.

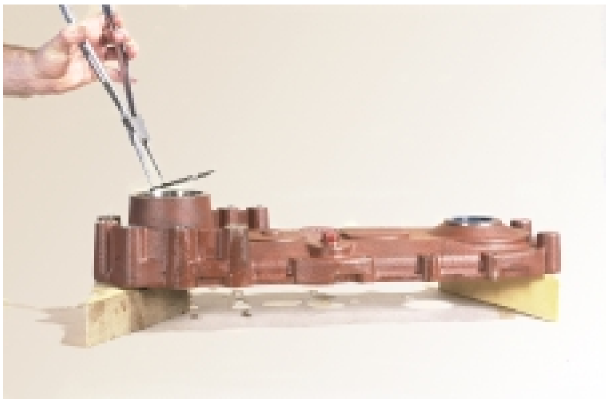


Figure 31
Remove seal sleeve retaining ring.



Figure 32
Tap seal sleeve from cover.

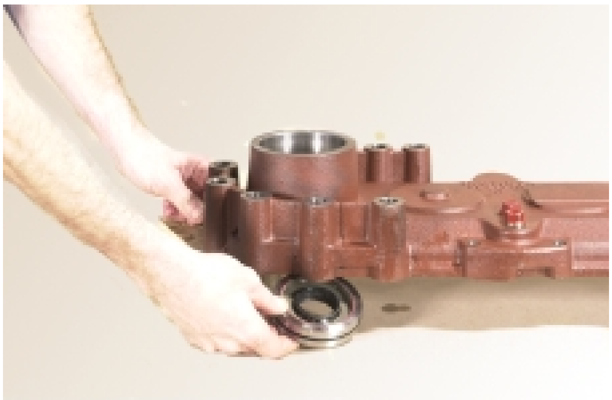


Figure 33
Seal sleeve removed.

Refer to "Cleaning & Inspection" pages.



Figure 34

Install two new oil seals in the seal sleeve.
See assembly instructions (page 7-2 and 7-3).



Figure 35

Install two new output shaft oil seals in front and rear cover.
See assembly instructions (page 7-2 and 7-3).



Figure 36

Install seal sleeve retaining ring.

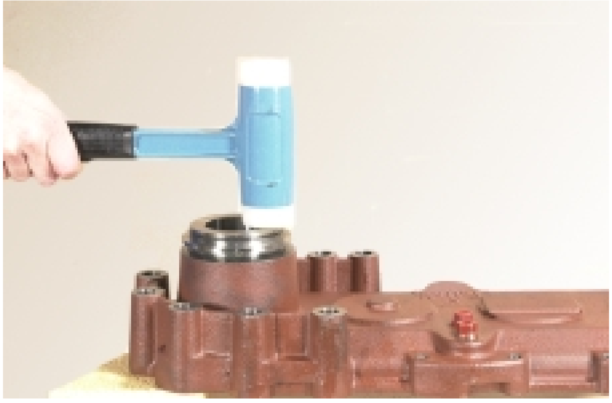


Figure 37

With new "O" rings installed. Tap center sleeve into position.



Figure 38

With new "O" ring installed. Install seal sleeve.



Figure 39

Install input shaft into rear cover.
Use caution as not to damage oil seals.

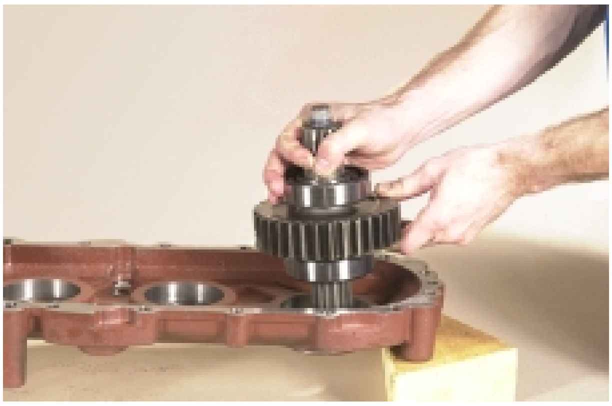


Figure 40

Install output shaft into rear cover.
Use caution as not to damage oil seal.

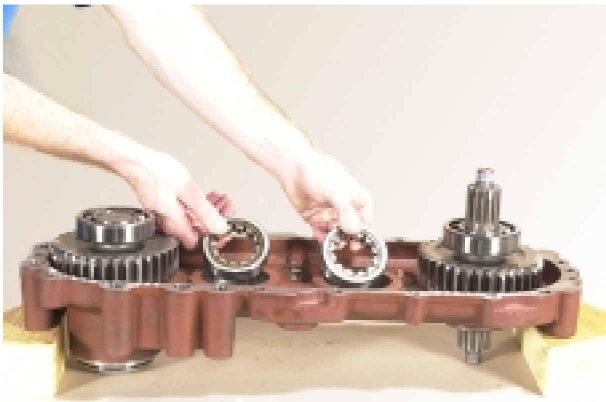


Figure 41

If bearing outer races have been removed, install bearing outer races.

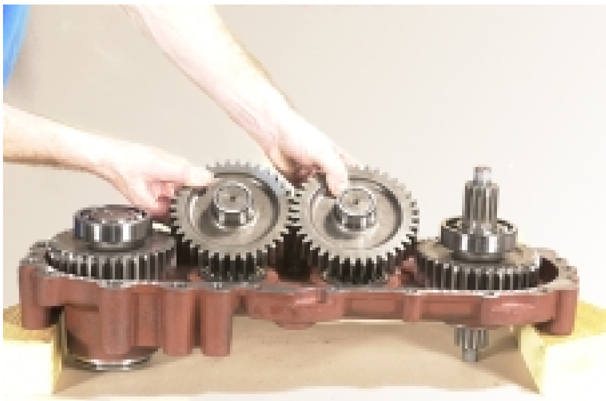


Figure 42

Install idler shafts and gears.

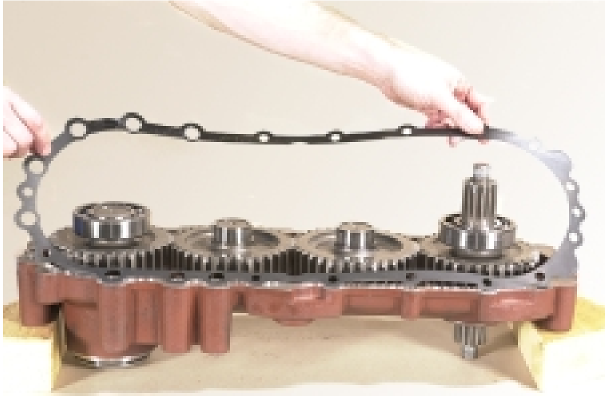


Figure 43

Position new gasket on rear cover.



Figure 44

Position drop box front cover on rear cover.
Use caution as not to damage oil seal.

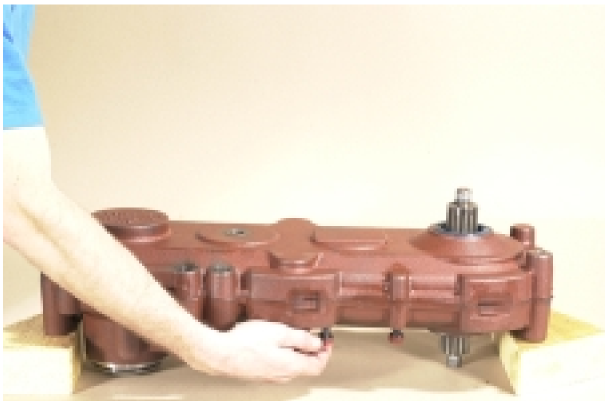


Figure 45

Install capscrews and lockwashers.

Reassembly of 4 shaft drop box

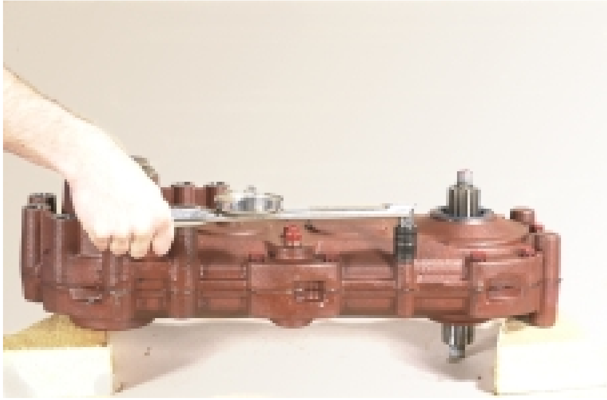


Figure 46

Tighten screws to specified torque. (See torque chart).



Figure 47

Install coupling sleeve retaining ring.

Reassembly of 4 shaft drop box

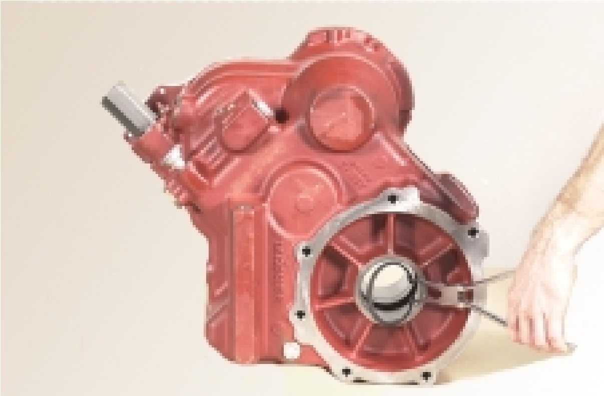


Figure 48

Install output shaft rear bearing locating ring.

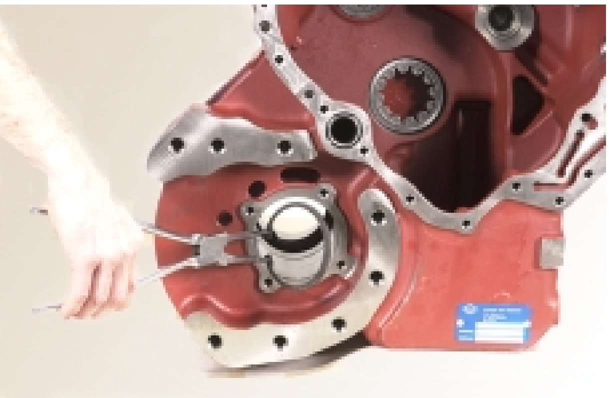


Figure 49

Install output shaft front bearing locating ring.

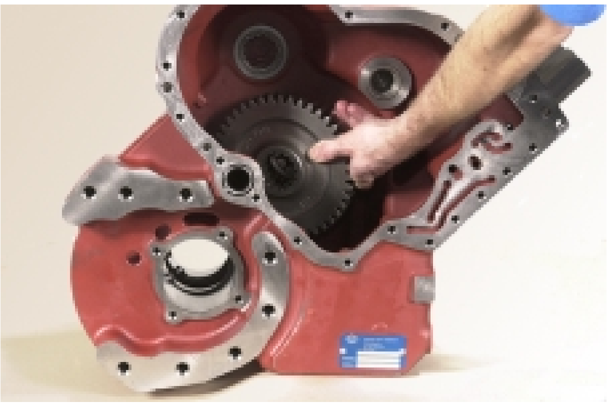
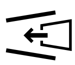


Figure 50

From the front of transmission case, position output gear with long hub of gear towards the front.



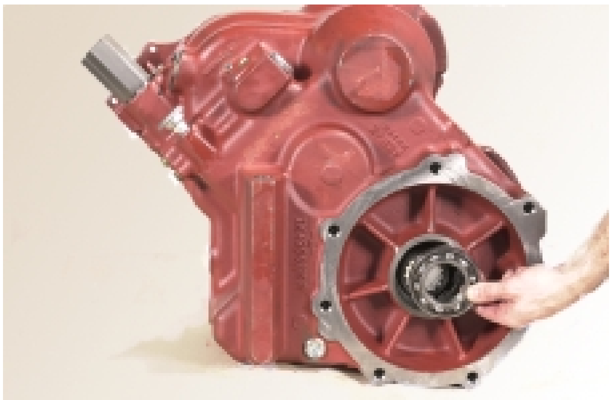


Figure 51

Install output shaft rear bearing in case against locating ring.

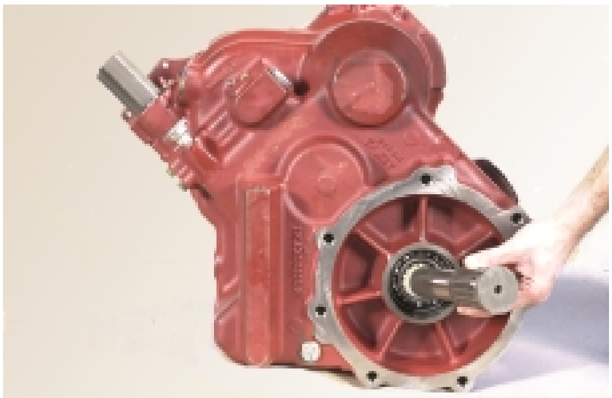


Figure 52

Position output shaft. Align splines on shaft with splines in output gear. Tap shaft into position.

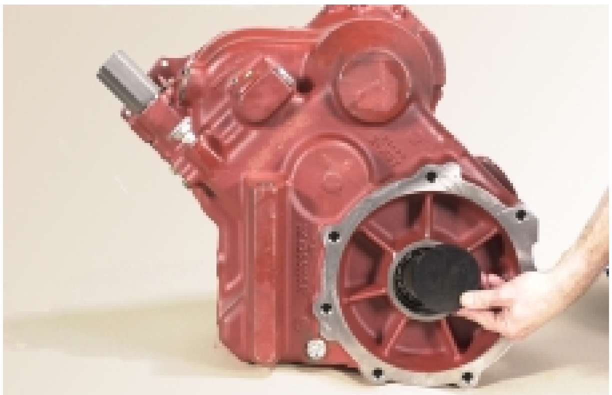


Figure 53

Install new bore plug.



Reassembly of 4 shaft drop box

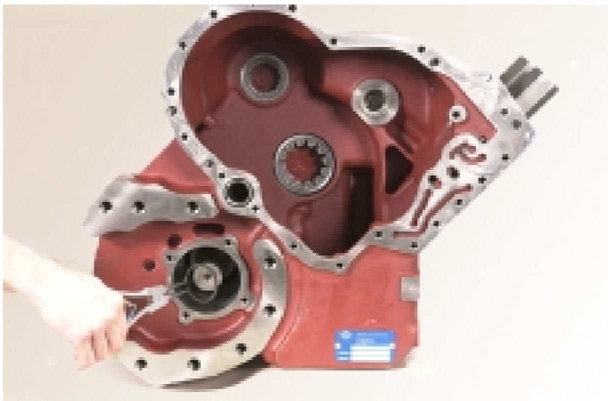


Figure 54

Install output shaft gear retaining ring.

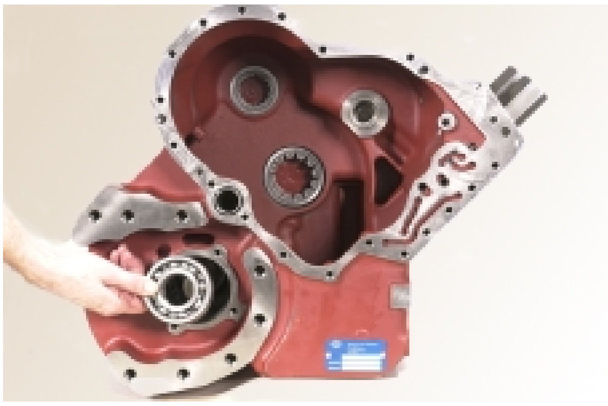


Figure 55

Install output shaft front bearing in case against locating ring.

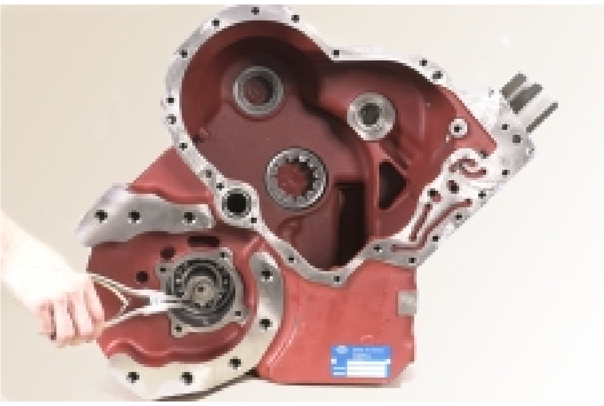


Figure 56

Install front bearing retaining ring.

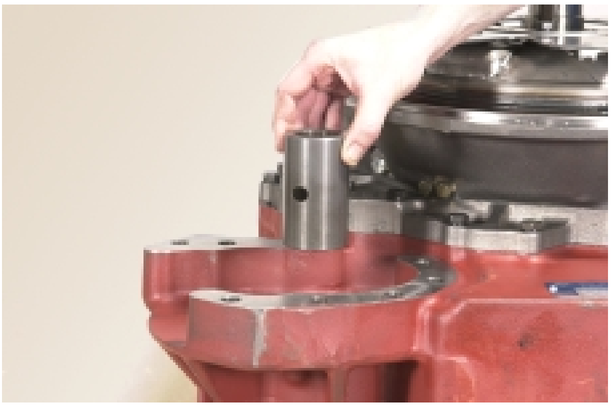


Figure 57

Install coupling sleeve.

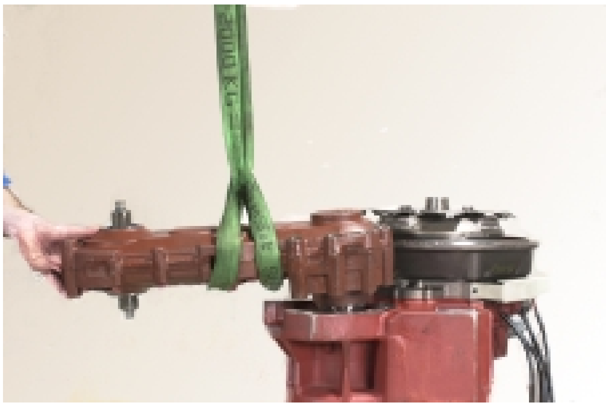


Figure 58

Install drop box assembly.

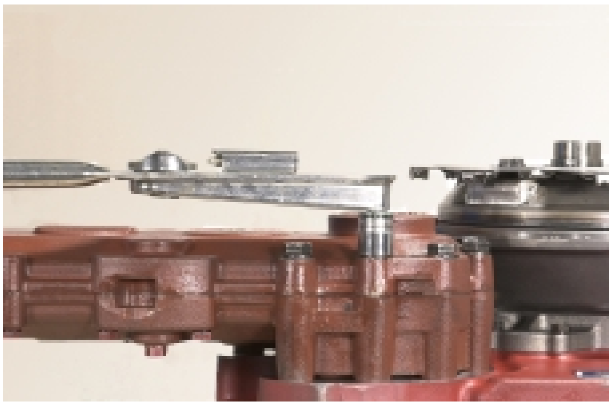


Figure 59

Install drop box mounting screws and lockwashers. Tighten to specified torque. (See torque chart).

Reassembly of 4 shaft drop box



Figure 60
Install front and rear output flanges.



Figure 61
Install flange “O” rings, washers and nuts



Figure 62
Block flanges to prevent turning.
Tighten flange nuts to specified torque.
See assembly instructions page 7-4.

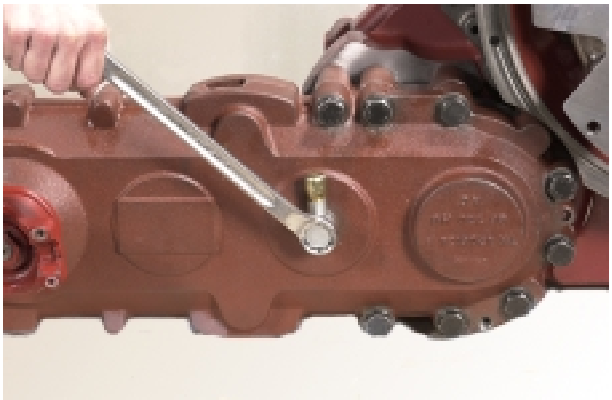


Figure 63
Install breather.